CONFORMED COPY
DIVISION ONE
METRO PIPELINE COMPANY

PROPOSAL,

CONTRACT, BONDS AND SPECIFICATIONS
FOR
CONSTRUCTING WATER SYSTEM IMPROVEMENTS
FOR
THE CITY OF ATHENS, GEORGIA

Julius F. Bishop, Mayor

CITY COUNCIL

Luther T. Bond	Cecil L. Johnson
David H. Seagraves	Dwain P. Chambers
J. Comer Whitehead	Hugh R. Hale
Robert H. Kimbrell	W. Calvin Bridges
Walter N. Danner	Lee H. Guest

Joseph J. Gaines, City Attorney
Allen G. Smith, City Clerk
H. Lamar Pittard, City Engineer
J. G. Beacham, City Engineer, Emeritus

EDA PROJECT NO. 04-1-00400

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

March, 1969

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EDA PROJECT NO. 04-1-00400

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

March, 1969

ADDENDUM NO. 1

TO

PLANS AND SPECIFICATIONS

FOR

CONSTRUCTING WATER SYSTEM IMPROVEMENTS

FOR

THE CITY OF ATHENS, GEORGIA

EDA PROJECT NO. 04-1-00400

Bids Received Until 2:00 P.M., E.D.S.T., June 12, 1969

Plans and Specifications issued for this project are hereby amended in accordance with Addenda given in the following. All proposals will be subject to these Addenda.

Plans Division One

Sheet No. 10	Station 28+16 Profile: Complete casing stationing as follows: 27 + 92 to 28 + 40.
Sheet No. 13	Station 172+20 Plan: Change casing to 50 L.F. of 36" casing.
Sheet No. 2	The 20" Raw Water venture meter shall be installed in the line at coordinates M+75, 12+06 complete with 6'-0" diameter venture manhole. The mercury well transmitted shall be installed in the bottom floor of the chemical building. An existing orifice plate in this line shall be removed.
Sheet No. 4	The roof ventilator shown shall be equal to ILG CRF-A-100. The air inlet louver shall be installed in east wall between the window and the north corner @ elevation 58.0. The louver shall be 24" square.
Sheet No. 4	Foundation Plan: Change 3'-4" dimensions from wall to traveling screen to 3'-6".

Plans Division Two

Filter Modifications

The attached sketch shows the typical arrangement of the solenoid valve manifold required for each of eight filters. The manifold shall be mounted in the pipe gallery on the filter wall.

Sheet No. 4

Gates shall have cast iron slides and frames with seating surfaces of naval bronze and shall be furnished with flange back, flush bottom seals and wall thimble. The gate between the raw water suction wells shall be equipped with necessary wedges and wedge blocks and shall be reinforced for 50 seating pressure and 25 feet unseating pressure. The raw water influent gates shall be equipped for 35 feet seating pressure. Gates shall be as manufactured by Armco, Rodney Hunt, or approved equal.

Operators shall be cast iron crank type with bronze left nuts and equipped with ball bearings.

Stems for all gates shall be of cold rolled steel, proportioned so that the unsupported length does not exceed an l/r value of 120 for either full stem diameter or the net diameter at roof of thread. Stop nuts and blocks shall be provided on all stems for upper and lower limits of gate travel.

Intermediate stem guides shall be furnished as necessary and shall be of cast iron and fully adjustable about the two axes normal to the stem.

All parts of the gate, slide, frame, stem, etc., below the operating slab or floor shall be coated as specified under "Painting". Any portion which projects above the operating slab shall be painted in accordance with the Contractor's approved painting schedule. At the Contractor's option, gates and frames may be furnished with or without the vendor's standard shop coat of paint. After receipt on the job, all gates and frames shall be sandblasted and coated in accordance with the Contractor's approved painting schedule. Gates and frames shall not be dismantled under any conditions. Portions of frames to be set in concrete shall not be painted.

(d) Anchor and Assembly Bolts: Standard practice as to anchor and assembly bolts shall be strictly followed. Grip for all bolts shall be the full depth of the nut. All anchor bolts shall be as specified elsewhere.

Plans Division Two (Continued)

Sheet No. 4 (Continued)	(e) Drawings: Furnish detailed shop drawings for approval, giving weight schedules for seat, slide, hand wheels and lifts, together with all bolt, stem, and structural member sizes. Gates will be subject to rejection unless accompanied by the above information.
Sheet No. 6	Section "Y-Y" show pipe straps 1/4" x 3" with 3/4" ⌀ anchor bolts.
Sheet No. 7	Entrance Floor Plan roof ventilator shall be equal to ILG CRF-A-122.
Sheet No. 9	Change width of all flocculation chambers to 10'-8".
Sheet No. 10	Section A-A; Change flocculator to 6'-6" diameter mixing paddles.
Sheet No. 11	Status Board shall be installed in the wall between the desk and cabinets in the Control Room and shall have indicating lights for all raw water and high service pumps and shall have indicating lights for high or low tank level and booster pump operation to be connected to the existing and proposed telemetered signals at meter panels in the same room.
Sheets 12 and 13	The following valves are to be furnished and installed for each filter: 4" hyd. op. Gate valve in rewash line. 4" hyd. op. Butterfly valve in surface wash line. 16" hyd. op. Butterfly valve in wash water line. 16" hyd. op. Butterfly valve in filter drain line. 16" hyd. op. Butterfly valve in filter influent line. Nine (9) 20" Butterfly valves with manual operators are required in the filter influent headder.
Sheet No. 20	Pressure gages shall be installed in the monitoring panel at set rate stations to indicate the control pressure and set pressure.
Sheet No. 20	The total filter rate signal converter shall convert the pneumatic signal to either a ma signal or time duration signal to operate the controller on the fluoride volumetric feeder.
Sheet No. 22	Unit Heaters in the chlorine storage room and lime feed room shall be 7.5 KVA. The unit heater in the carbon feed room shall be 5 KVA. All unit heaters shall be 208 V single phase.
Sheet No. 24	Entrance Floor Plan: The lighting panel shall be located in the wall between the Control Room entrance door and the chemical feed room entrance door.

Plans Division Two (Continued)

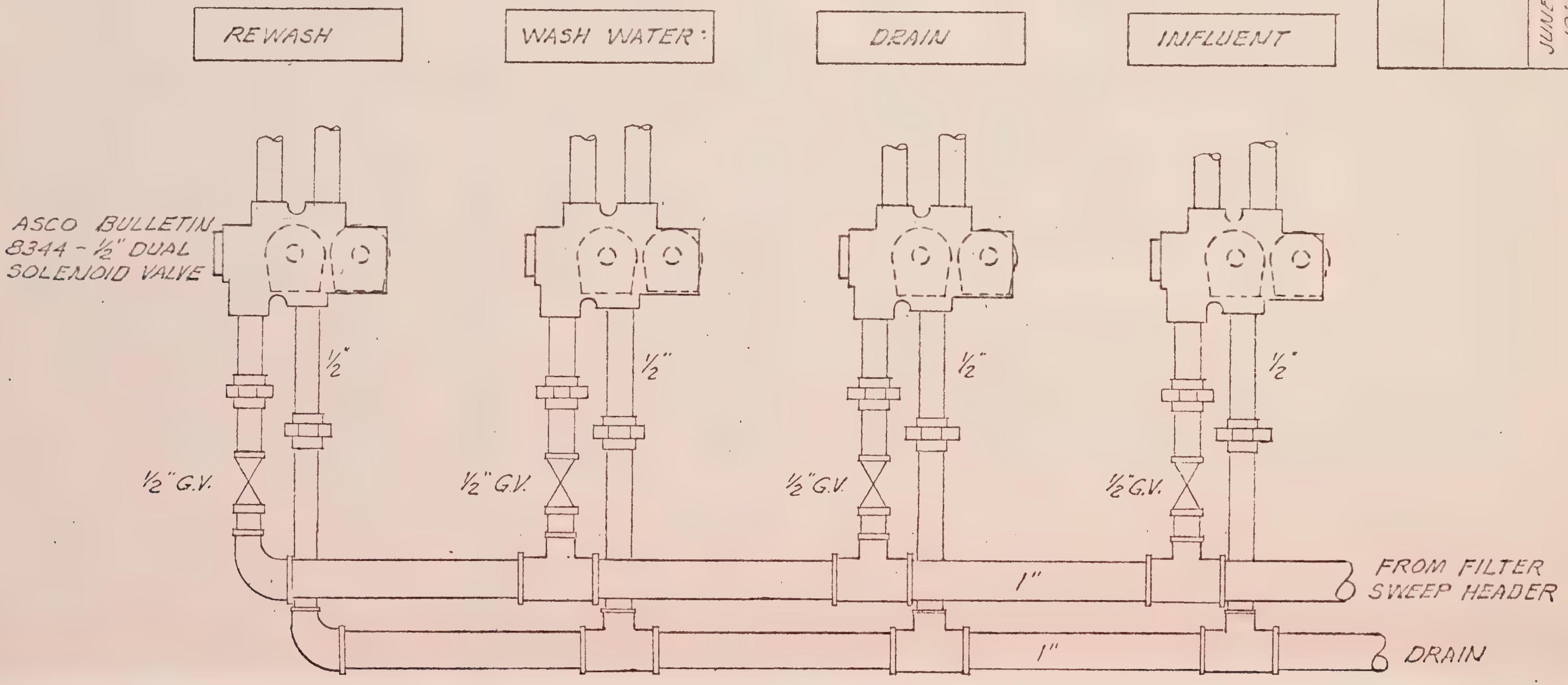
Sheet No. 25	Service Floor Plan: The lighting arrestors in the High Service Pumping Station shall be located on the south wall of the piping gallery.

Specifications

Page 7-17	Paragraph 7.22 (a): Change incubator adjustment to 0° to 40° C.
Page 9-10	Paragraph 9.06: Delete last sentence in first paragraph and extend paragraph as follows: Furnish four 8-inch illuminated dial indicators; two shall have a range of 0 to 30 feet and indicate the water level in the suction wells; two shall have a range of 0 to 24 inches and indicate the differential across the screen. The differential alarm shall be transmitted through the relay equal to an indicating light and audible alarm at the status board.
Page 9-17	Paragraph 9.26 (b) 2 (a): Extend this paragraph as follows: Eight filter consoles are required.
Page 9-24	Paragraph 9.43(i): Extend paragraph to include Chain Belt Company, or Link Belt Company.
Page 9-24	Paragraph 9.44 (a): Extend paragraph to include Chain Belt Company, or Link Belt Company.
Page 12-2	Paragraph 12.03 (a): Extend paragraph as follows: Steel pipe shall be 16" I.D. after lining.
Section 12	Extend section to include the following: Fire hydrants shall be improved A.W.W.A. three-way hydrants with 4-1/4-inch valve and shall have mechanical joint inlet connections with strapping lugs. Hydrants shall be Mueller A-24009, or approved equal.

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

June 2, 1969


REWASH
WASH WATER:
DRAIN
INFLUENT
ASCO BULLETIN 8344 - ½" DUAL SOLENOID VALVE
½"
½" G.V.
½"
½" G.V.
½"
½" G.V.
½"
½" G.V.
1"
FROM FILTER SWEEP HEADER
1"
DRAIN

SOLENOID VALVE HEADER

EDA PROJECT NO. 04-1-C0400

WATER SYSTEM IMPROVEMENTS
CITY OF ATHENS, GEORGIA

SKETCH TO ACCOMPANY
ADDENDUM NO. 1

JUNE 2 1969	WIEDEMAN & SINGLETON ENGINEERS	1

ADDENDUM NO. TWO

TO
PLANS AND SPECIFICATIONS
FOR
CONSTRUCTING WATER SYSTEM IMPROVEMENTS
FOR
THE CITY OF ATHENS, GEORGIA

EDA PROJECT NO. 04-1-00400

BIDS RECEIVED UNTIL 2:00 P.M., E.D.S.T., JUNE 12, 1969

Plans and Specifications issued for this project are hereby amended in accordance with Addenda given in the following. All proposals will be subject to these Addenda.

Addendum No. 1	First page - changes to Sheets No. 2 and No. 4 are for Division Two work.
Addendum No. 1	Sketch of Solenoid Header - The header should be extended to include a solenoid for the surface wash valve.
Addundum No. 1	Page 3 - Sheets 12 and 13: Filter influent valves is to be 20" hydralic operated as shown on plans.

SPECIFICATIONS

Page No. 9-19	Paragraph 9.28 Rate Controllers: Change first sentence as follows: "Filter rate controllers shall be 12" size indirect acting type BIF Model RCB-T or Simplex Model RFH".
Page No. 9-24	Paragraph 943 (a)(1): Delete entire paragraph and substitute the following. Construction: Each paddle assembly shall have a minimum of (2) two structural steel arm supports welded or keyed to the shaft and cross braced to provide a rigid assembly. Paddle arms shall be structural steel angles to which the paddle blades are bolted. Paddle blades may be fabricated from 1/8" steel plate, crimped for strength or 2" heart red wood.
Page No. 9-25	Paragraph 9.43 (c) Drive: Extend to include the following: a clutch arrangement shall be furnished and installed to enable either flocculation basin to be taken out of service. Chain guards shall be furnished and installed for all drive chains.
Page No. 9-26	Paragraph 9:45 - Center Drive Mechanism: Change diameter of ball race to 42-inches and minimum torque to 6,000 foot-pounds.
Page No. 9.27	Paragraph 9.49 - Rotating Arms: Change minimum length of rake blades to 7 feet.

Page No. 9.28

Paragraph 9.52 - Filter Surface Wash: Change piping for filter sweeps to red brass. Change nozzles to nylon anti-siphoning nozzles.

Page No. 9.39

Paragraph 9.67 - Post Flash Mixer: Change to read as follows:

The Contractor shall furnish and install one (1) flash mixer mechanism, complete with supports and motor drive, at the location shown on the drawings. The mechanism shall be equipped with vertical electric motor drive, mounted on steel beam supports on top of the flash mixer, with vertical shafting for the rotating element within the chamber below, and shall be hydraulically balanced and free from vibration.

(a) Capacity: The mechanism shall be capable of continuously blending 14,000 GPM of chemically treated water, so that at points of discharge the concentration of coagulants shall be uniform.

(b) Vertical Shaft and Bearings: The vertical shaft shall be of steel, mounted in suitable anti-friction bearings, and supported in a suitable housing. Bearings shall be of ample capacity for all thrust loads.

(c) Rotating Element: The rotating element shall be designed and sized so as to transfer the energy of the motor at full rated load, to the water passing through the flash mixer, and shall rotate at approximately 56 RPM.

(d) Motor: The electrical motor for operation of the flash mixer shall be 480 volt, 3 phase, 60 cycle, 870 RPM with weatherproof enclosure, of ample size to operate the flash mixer without overload, and with a minimum full load rating of 7-1/2 HP, furnished with starter.

(e) Manufacturer: The flash mixer mechanism complete with motor shall be furnished as manufactured by Dorr Co., Walker Process Co., American Well Works, Link Belt Co. or Chain Belt Co.

PLANS, DIVISION TWO

Sheet 2

Extended Bonnet Valve: The following yard valves require extended bonnet operations.

3 - 42" on filter effluent and by-pass.

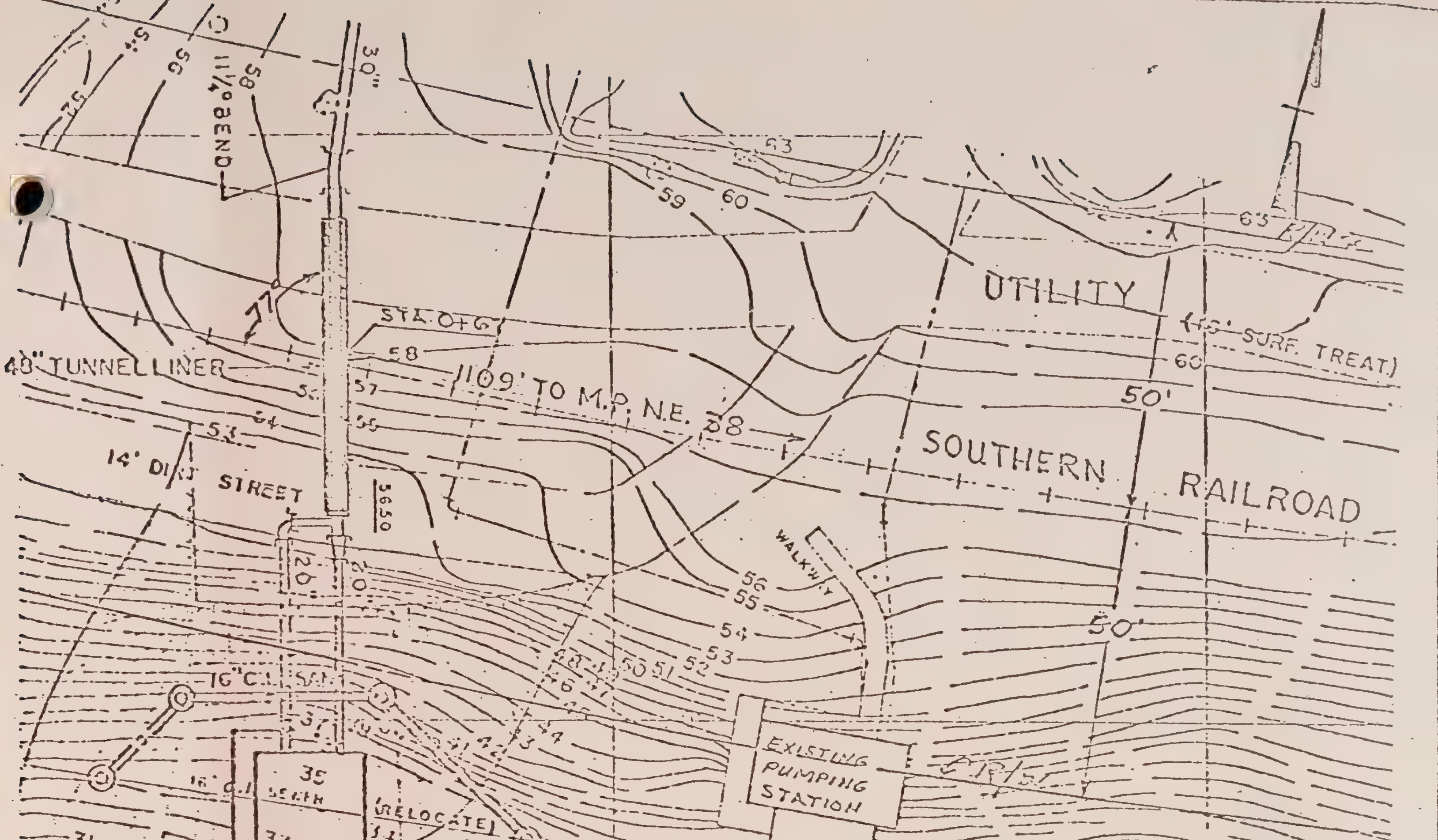
3 - 42" on 2.75 million gallon clear well and by-pass.

1 - 30" on high service discharge.

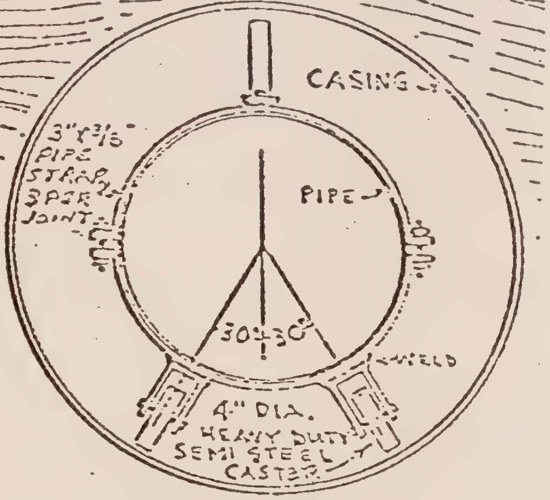
Sheets No. 2, 3, and 6	Railroad Crossing: The fittings and length of tunnel liner required for the raw water railroad crossing are shown on the attached sketch.
Sheet No. 17	High Service Pump Station Sump Pump: The sump pump to be furnished and installed where shown on the plans shall be furnished with a basin cover for a 24" diameter, 3'-0" deep sump. The pump shall be automatically controlled by an enclosed float operated switch with heavy copper float, float rod, and guide pipe. The unit shall be similar to and equal to Chicago Pump Company's Model Lb-2 or approved equal, and shall deliver 10 gpm @ 22 ft. TDH.

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

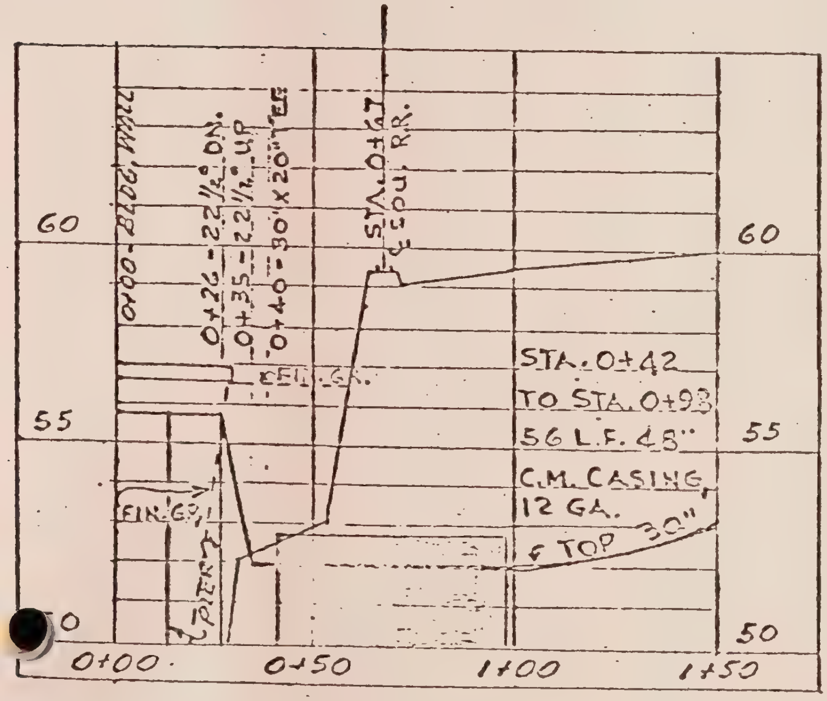
June 5, 1969


30"
58
56
11¼° BEND
63
59
60
65
UTILITY
STA. 0+67
48" TUNNEL LINER
58
57
56
55
54
53
1109' TO M.P. N.E. 58
(15' SURF. TREAT.)
60
50'
SOUTHERN RAILROAD
14' DIRT STREET
56.50
20
20
WALKWAY
56
55
54
53
52
50'
16" C.I. SAN.
EXISTING PUMPING STATION
35
16" C.I. SEWER
RELOCATE
34
31
32
PROPOSED PUMPING STATION
OCONEE RIVER

PLAN
1" = 30'


CASING
3"x3/16" PIPE STRAP 3 PER JOINT
PIPE
30°
30°
WELD
4" DIA. HEAVY DUTY SEMI STEEL CASTER

DETAIL 30" WATER LINE THROUGH CASING


60
55
50
0+26 - 22½° DN.
0+35 - 22½° UP
0+40 - 30" x 20" TEE
STA. 0+67 ℄ SOU. R.R.
EXIST. GR.
STA. 0+42 TO STA. 0+93 56 L.F. 48" C.M. CASING 12 GA.
FIN. GR.
PIER
℄ TOP 30"
0+00
0+50
1+00
1+50

PROFILE
1" = 50' HOR.
1" = 5' VERT.

NOTE: Pipe line crossing shown shaded. Pipe line to be installed and maintained in accordance with Southern Railway System specifications dated October 1, 1958 for pipe line crossings under railway tracks & right-of-way for non-flammable substances.

EDA PROJECT NO. 04-1-00400

CITY OF ATHENS GEORGIA
WATER SYSTEM IMPROVEMENTS

PLAN AND PROFILE
30" RAW WATER LINE

JUNE 1969	WIEDEMAN & SINGLETON ENGINEERS ATLANTA GEORGIA	1 OF 1

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ADVERTISEMENT FOR BIDS

Economic Development Administration
Project No. 04-1-00400

CITY OF ATHENS, GEORGIA

Owner

Separate sealed bids for Water System Improvements, will be received by the City of Athens, Georgia at the City Hall until 2:00 P.M., E.D.S.T., June 12, 1969, and then at said office publicly opened and read aloud.

The Information for Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Forms of Bid Bond, Performance and Payment Bond, and other contract documents may be examined at the following:

City Hall, Athens, Georgia

Wiedeman and Singleton, Engineers, 1789 Peachtree Road, N.E.,
Atlanta, Georgia 30309.

The work to be done consists of the following divisions of work:

DIVISION ONE - Construction of approximately 51,600 feet of 16-inch pipeline, approximately 28 butterfly valves and associated small piping, and connections. Three railroad crossings requiring either tunneling or boring are required. Bids on steel pipe and ductile iron pipe are required.

DIVISION TWO - Construction of filtration plant additions, consisting principally of a new raw water intake, pumping station, clearwell and high service pumping station, replacing filter gallery piping, installing new chemical feed and instrumentation equipment, and other associated work. Modifications to the existing Five Points Booster Station and Construction of the Bogart Booster Station are also included.

Plans and Specifications may be obtained from Wiedeman and Singleton, Engineers, 1789 Peachtree Road, N.E., Atlanta, Georgia 30309, for the following deposits.

DIVISION ONE - Plans	$ 25.00
DIVISION TWO - Plans	$ 50.00
DIVISION ONE and/or TWO - Specifications	$ 20.00

Upon return of Plans and Specifications in good condition, within thirty (30) days after the date of opening of bids, one-half the deposit will be refunded.

A Contract Performance Bond and Payment Bond, each in an amount equal to 100% of the contract amount will be required.

The Owner reserves the right to waive any informalities or to reject any or all bids.

Each bidder must deposit with his bid, security in the amount, form and subject to the conditions provided in the Information for Bidders. A 10% bid bond or certified check is required.

Attention of bidders is particularly called to the requirements as to conditions of employment to be observed and minimum wage rates to be paid under the contract.

No bidder may withdraw his bid within 90 days after the actual date of the opening thereof.

Julius F. Bishop
Mayor

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

March, 1969

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids: The City of Athens, Georgia (herein called the "Owner"), invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the City Hall, Athens, Georgia, and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to The City of Athens, Georgia and designated as "Bid for Water System Improvements, Division ____."

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 30 days after the actual date of the opening thereof.

2. Preparation of Bids: Each bid must be submitted on the prescribed form and accompanied by Certification by Bidder Regarding Compliance with Executive Order 11246, Form EDA - 119. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and the foregoing Certification must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope, addressed or specified in the bid form.

3. Subcontracts: The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this contract

a. Must be acceptable to the Owner and Economic Development Administration.

b. Must submit Form EDA - 120, Certification by Proposed Subcontractor Regarding Compliance with Executive Order 11246. Approval of the proposed subcontract award cannot be given by the Owner unless and until the proposed subcontractor has submitted the Certification and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject.

Although the bidder is not required to attach such Certifications by proposed subcontractors to his bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

4. Telegraphic Modification: Any bidder may modify his bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic communication is received by the Owner prior to the closing time, and provided further, the Owner is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. The telegraphic communication should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by

the Owner until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the telegraphic modification.

5. Qualifications of Bidder: The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

6. Bid Security: Each bid must be accompanied by cash, certified check of the bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 10% of the bid. Such cash, checks or bid bonds will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining cash, checks, or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or if no award has been made within 90 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid.

7. Liquidated Damages for Failure to Enter Into Contract: The successful bidder, upon his failure or refusal to execute and deliver the contract and bonds required within 10 days after he has received notice of the acceptance of his bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his bid.

8. Time of Completion and Liquidated Damages: Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete the project within the specified consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages, the sum of $50.00 for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

9. Conditions of Work: Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his contract. Insofar as possible the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

10. Addenda and Interpretations: No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to Wiedeman and Singleton, Engineers, at 1789 Peachtree Road, Atlanta, Georgia 30309, and to be given consideration must be received at least five (5) days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes), not later than three (3) days prior to the date

fixed for the opening of bids. Failure of any bidder to receive any such Addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All Addenda so issued shall become part of the contract documents.

11. Security for Faithful Performance: Simultaneously with his delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner.

12. Power of Attorney: Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

13. Notice of Special Conditions: Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

(a) Inspection and testing of materials.

(b) Insurance requirements.

(c) Wage rates.

(d) Stated allowance.

14. Laws and Regulations: The bidder's attention is directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

15. Method of Award - Lowest Qualified Bidder: If at the time this contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed the amount of funds then estimated by the Owner is available to finance the contract, the contract will be awarded on the base bid only. If such bid exceeds such amount, the Owner may reject all bids or may award the contract on the base bid combined with such deductible alternates applied in numerical order in which they are listed in the Form of Bid, as produces a net amount which is within the available funds. The Owner reserves the right to reject all bids or any item in the Proposal and to award a contract based on a total amount equal to the sum of the remaining items.

16. Obligation of Bidder: At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his bid.

17. Proposals: The Proposals which follow are for two divisions of work. The bidder may submit a bid for one or any combination of divisions but all bids must be for a complete division of work including all parts and items. The bidder shall write in the words NO BID in the blanks for Divisions of work he

does not desire to bid. All Proposals shall be filled out in ink.

18. Laying Schedules: The plans are detailed showing standard fittings for cast iron fittings. If the Bidder elects to furnish steel or prestressed concrete type pipe, he shall furnish a complete laying schedule itemizing each pipe and fitting in accordance with the Specifications and Industry practice for these types of pipe. All such laying schedules shall be checked and approved by the Engineer.

19. Existing Piping and Equipment: The Contractor receiving the award for Division Two will be expected to salvage all piping and equipment noted to be removed, the Contractor may re-use any such piping and equipment in the new work where it is practical to do so and within the requirements of the plans and specification. Any salvaged piping or equipment not re-used shall be delivered to the Owner's warehouse in good condition.

20. Complete Work Required: The Specifications, the plans, and all supplementary documents are essential parts of the Contract, and requirements occurring in one are as binding as though occurring in all. They are intended to be cooperative, to describe and provide for a complete work. In case of discrepancy in the plans, figured dimensions shall govern. In case of omissions from the specifications as to items of equipment, and materials or quantities therefor, the plans shall govern. It shall be the responsibility of the bidder to call to the attention of the Engineer obvious omissions of such magnitude as to affect the strength, adequacy, function, completeness, or cost of any part of the work in ample time for amendment by addendum prior to letting date.

PROPOSAL

Place: Athens, Georgia
Economic Developement Administration
Project No. 04-1-00400

Proposal of METRO PIPELINE COMPANY (hereinafter called "Bidder")*, a corporation, organized and existing under the laws of the State of GEORGIA *, a partnership, or an individual, doing business as ______.

To the City of Athens, Georgia (hereinafter called the "Owner")

Gentlemen:

The Bidder, in compliance with your invitation for bids for the construction of Water System Improvements, Division One, having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project within the consecutive calendar days listed below, thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of $50.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

ALLOWABLE COMPLETION TIME

DIVISION ONE	365 Calendar Days

Bidder acknowledges receipt of the following addendum:

No. 1 and No. 2

---

* Insert corporation, partnership or individual as applicable.

BID

PROPOSAL FOR DIVISION ONE:

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
1.	51,500	L.F.	16" Pipeline 0'-4' Cover		
			Ductile Iron Pipe	$ 7.00	$ 360,500.00
			Steel Pipe	$	$ NO BID
2.	126	L.F.	16" Pipeline in Casing		
			Ductile Iron Pipe	$ 15.00	$ 1,890.00
			Steel Pipe	$	$ NO BID
3.	110	L.F.	8" C.I. Pipe	$ 3.50	$ 385.00
4.	700	L.F.	6" C.I. Pipe	$ 3.00	$ 2,100.00
5.	Lump Sum		16" Fittings	$ -	$ 15,000.00
6.	1.4	Tons	6", 8" and 12" Fittings	$ 700.00	$ 980.00
7.	3	Ea	8" x 8" T. S. and Valve with Valve Box	$ 250.00	$ 750.00
8.	28	Ea	16" B.V. and Valve Box	$ 850.00	$ 23,800.00
9.	11	Ea	8' G.V. and Valve Box	$ 150.00	$ 1,650.00
10.	46	Ea	6" G.V. and Valve Box	$ 90.00	$ 4,140.00
11.	53	Ea	Concrete Valve Markers	$ 8.00	$ 424.00
12.	39	Ea	Fire Hydrants	$ 225.00	$ 8,775.00
13.	16	Ea	1" Air Valve and Manhole	$ 425.00	$ 6,800.00
14.	8	Ea	2" Air Valve and Manhole	$ 600.00	$ 4,800.00
15.	20	Ea	Type "A" Blowoff, Incl. Hydrant	$ 400.00	$ 8,000.00
16.	6	Ea	Type "B" Blowoff	$ 300.00	$ 1,800.00
17.	50	Cu.Yd.	Class "B" Conc. Blocking	$ 50.00	$ 2,500.00
18.	2,900	L.F.	Extra Depth of Cover 4 to 6 ft. for 16" Pipe	$ .25	$ 725.00

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
19.	800	L.F.	Extra Depth of Cover 6 to 8 ft. for 16" Pipe	$ .50	$ 400.00
20.	100	L.F.	Extra Depth of Cover 8 to 10 ft. for 16" Pipe	$ 2.00	$ 200.00
21.	150	L.F.	Extra Depth of Cover 4 to 6 ft. for 6" and 8" Pipe	$ .50	$ 75.00
22.	110		Extra Depth of Cover 6 to 8 ft. for 6" and 8" Pipe	$ 1.00	$ 110.00
23.	50	L.F.	Extra Depth of Cover 8 to 10 ft. for 6" and 8" Pipe	$ 2.00	$ 100.00
24.	110	L.F.	Surface Treatment Paving Removed and Replaced	$ 2.00	$ 220.00
25.	6,000	L.F.	Plant Mix Paving Removed and Replaced	$ 2.00	$ 12,000.00
26.	30	L.F.	Concrete Paving Removed and Replaced	$ 10.00	$ 300.00
27.	30	L.F.	36" Casing or 48" Tunnel Liner Under Georgia Railroad At Winterville	$ 75.00	$ 2,250.00
28.	48	L.F.	36" Casing or 48" Tunnel Liner Under Georgia Railroad At Winterville Road	$ 75.00	$ 3,600.00
29.	48	L.F.	36" Casing or 48" Tunnel Liner under Seaboard Railroad at Voyles Road	$ 75.00	$ 3,600.00
30.	630	L.F.	Steel Guard Rail Removed and Replaced	$ 1.00	$ 630.00
31.	1	Ea	Connection to Exist. 6"	$ 50.00	$ 50.00
32.	7	Ea	Connection to Exist. 8"	$ 50.00	$ 350.00
33.	1	Ea	Connection to Exist. 12"	$ 125.00	$ 125.00
34.	1	Ea	Connection to Exist. 16"	$ 350.00	$ 350.00
35.	1	Ea	Remove Exist. Hydrant	$ 150.00	$ 150.00

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
36.	150	Cu.Yd.	Crushed Stone Bedding Including Removal of Unsuitable Material	$ 5.50	$ 825.00
37.	2,500	Cu.Yd.	Rock Excavation	$ 12.00	$ 30,000.00

TOTAL, Items 1 through 37, Inclusive, Using Ductile Iron Pipe Materials ________

FIVE HUNDRED THOUSAND THREE HUNDRED FIFTY-FOUR and No/100 - - - - - - - - - - - -

- Dollars ($ 500,354.00)

TOTAL, Items 1 through 37, Inclusive, Using Steel Pipe Materials ____________

____

________________________________ Dollars ($ NO BID)

The bidder proposes to furnish mechanical equipment of the following manufacture:

Butterfly Valves Pratt

Gate Valves Mueller or Clow

Hydrants Mueller or Clow

Air Valves Crispin

Changes shall be processed in accordance with Paragraph 17 (a) of the General Conditions.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

The Bid security attached in the sum of ______________________

TEN (10%) PER CENT OF BID

______________________ Dollars ($__________)

is to become the property of the Owner in the event the contract and bond are not executed within the time set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

Respectfully submitted: METRO PIPELINE COMPANY

Cecil M Forbes Jr.

By: /S/ CECIL M. FORBES, JR., PRESIDENT
(Title)

2823 VINEVILLE AVE., MACON, GEORGIA 31204
(Business Address)

(SEAL - if bid is by a corporation)

PROPOSAL

Place: Athens, Georgia
Economic Developement Administration
Project No. 04-1-00400

Proposal of ____
(hereinafter called "Bidder")*, a corporation, organized and existing under the

laws of the State of ____________________ *, a partnership, or an individual,

doing business as ____

To the City of Athens, Georgia, (hereinafter called "Owner")

Gentlemen:

The Bidder, in compliance with your invitation for bids for the construction of Water System Improvements, Division Two, having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project within the consecutive calendar days listed below, thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of $50.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

ALLOWABLE COMPLETION TIME

Division Two, Part A and D	620 Calendar Days
Division Two, Part B	240 Calendar Days
Division Two, Part C	180 Calendar Days

Bidder acknowledges receipt of the following addendum:

____

____

____

____

---

* Insert corporation, partnership or individual as applicable.

BID

PROPOSAL FOR DIVISION TWO:

Part A: Filtration Plant Additions

For furnishing all materials, labor and equipment necessary for the complete work of constructing filtration plant additions, including raw water intake, high service pumping stations, extensions and alterations to the existing plant, outside piping and all other work shown

on the plans and specified the lump sum bid of ____________________

____

__________________________________ Dollars ($________________)

Part B: Five Points Booster Station

For furnishing all materials, labor and equipment necessary for the complete work of constructing additions to the five points booster station as shown on the plans and specified the lump sum bid of

____

__________________________________ Dollars ($________________)

Part C: Bogart Booster Station and Altitude Valve

For furnishing and installing all materials, labor and equipment necessary for the complete work of constructing the Bogart Booster Station and the Baxter Street tank altitude valve pit as shown on the

plans and specified the lump sum bid of __________________________

____

__________________________________ Dollars ($________________)

DEDUCTIONS: If project cost exceeds available funds the following deductions will be made in the order indicated. The low bidder will be determined by the lowest bid including necessary deductions.

Deduction One: Five Points Booster Station

For omitting gas engine drive, complete including trickle charger, and heat exchanger, but retaining double extended shaft motor - - - - - - - - - - - - - $______________

Deduction Two: Filtration Plant Additions

For omitting structure to cover filters 4, 5, 6, 7, and 8 complete - $__________

Deduction Three: Filtration Plant Additions

For omitting 8 MGD raw water pumping unit, one leaf screen, one eductor with associated pump and all valves, piping and electrical work associated with this equipment, but covering holes with subway grating and providing plugs for pipelines and space for future installation of electrical work, complete as shown on the plans and specified - - - - - $__________

Deduction Four: Filtration Plant Additions

For omitting 8 MGD high service pumping unit, including pump, valves, piping and electrical work, but retaining provisions for future installation, complete as shown on the plans and specified - - - $__________

Part D: Unit Price Work

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
1.	245	Cu.Yds.	Rock Excavation Structural	$ 8.00	$ 1,960.00
2.	130	Cu.Yds.	Rock Excavation Pipeline	$ 12.00	$ 1,560.00
3.	220	Cu.Yds.	Crusher Run Stone Backfill Including Removal of Unsuitable Material - Structural	$______	$__________
4.	50	Cu.Yds.	Crushed Stone Backfill Including Removal of Unsuitable Material - Pipeline	$______	$__________
5.	25	Cu.Yds.	Class "B" Concrete Foundations Including Excavation	$______	$__________
6.	30	Cu.Yd.	Class "B" Concrete Blocking	$______	$__________

TOTAL Part D, Items 1 through 6 $__________

TOTAL PARTS A, B, C, and D ____

____ Dollars ($__________)

The bidder proposes to furnish mechanical equipment of the following manufacture:

Butterfly Valves: ____________________

Gate Valves: ____________________

Traveling Screens: ____________________

Raw Water Pumps and Motors: ____________________

Chemical Feed Equipment: ____________________

Floculation Equipment: ____________________

Collector Equipment: ____________________

Instrumentation Equipment: ____________________

High Service Pumps and Motors: ____________________

Ball Valves: ____________________

Vacuum Priming System: ____________________

Filter Sweeps: ____________________

Post Mixing Equipment: ____________________

Five Points Booster Pump and Motor: ____________________

Engine for Five Points Pump: ____________________

Bogart Booster Pump: ____________________

Altitude Valve: ____________________

Electrical Equipment: ____________________

Lab Equipment: ____________________

SEASONAL DEDUCTIONS: The Owner will retain the option to deduct the following until completion of construction:

For substituting rye grassing for bermuda grassing - -

Deduct: $____________

For eliminating grassing, except for resodding the filter effluent header - - - - - - - - - - - - - - - - - -

Deduct: $____________

Changes shall be processed in accordance with Paragraph 17 (a) of the General Conditions.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds as required by Paragraph 29 of the General Conditions.

The bid security attached in the sum of ______________________________

____

____ Dollars ($_______________)
is to become the property of the Owner in the event the contract and bond are not executed within the time set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

Respectfully submitted:

By: ____
(Title)

____
(Business Address)

(SEAL - if bid is by a corporation)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, ______________

____, as Principal, and

____, as Surety,

are hereby held and firmly bound unto The City of Athens, Georgia, as Owner, in the penal sum of ____

____

____ Dollars ($________________________)
for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

Signed, this ____ day of ______________________________, 1967.

The Condition of the above obligation is such that whereas the Principal has submitted to The City of Athens, Georgia, a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for the complete work of Constructing Water System Improvements,

Division(s) ____

for the amount of ____

____ Dollars ($________________________)

NOW, THEREFORE:

(a) If said Bid shall be rejected, or in the alternate,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid,

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulated and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

____(L.S.)
Principal

____
Surety

By: ____

IMPORTANT - Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

CONSTRUCTION AGREEMENT

STATE OF GEORGIA

CLARKE COUNTY

THIS AGREEMENT, made and entered into on the 8th day of August, 1969, by and between The City of Athens, Georgia, party of the first part (hereinafter called the "Owner"), and METRO PIPELINE COMPANY party of the second part (hereinafter called the "Contractor").

WITNESSETH:

That the Contractor, for the consideration hereinafter fully set out, hereby agrees with the Owner as follows:

1. That the Contractor will furnish all equipment, tools, materials, skill and labor of every description necessary to carry out and complete in a good, firm, substantial and workmanlike manner, the work specified, in strict conformity with the drawings, Sheets 1 through 13 entitled "City of Athens, Georgia, Water System Improvements", and the Specifications hereinafter set forth, which drawings and Specifications, together with the Proposal made by the Contractor, the Advertisement for Bids, Instructions to Bidders and Special Provisions, General Conditions, this Agreement, Performance and Payment Bonds, and all Addenda annexed hereto, shall form essential parts of this Agreement, as if fully contained herein. The work covered by this Agreement includes all work as shown on the drawings, specified and listed in the attached Proposal as Division ONE.

2. That the Contractor shall commence the work to be performed under this Agreement on a date to be specified in a written order of the Owner's Engineer and shall fully complete all work hereunder within 365 consecutive calendar days from said date, except as otherwise provided in these documents for extensions of the above time limit, Time is of the essence of this contract and the Contractor shall pay to the Owner, not as a penalty, but as liquidated damages the sum of fifty ($50.00) dollars for each calendar day that he shall be in default of completing the work within the time limit named herein. Because of the difficulty of fixing damages suffered by the Owner on account of such default, damages are herein agreed upon as stated.

3. The Owner hereby agrees to pay to the Contractor for the faithful performance of this Agreement, subject to additions and deductions as provided in the Specifications or Proposal, in lawful money of the United States, the sum of

FIVE HUNDRED THOUSAND, THREE HUNDRED FIFTY-FOUR AND NO/100 --- Dollars ($500,354.00)

4. No later than the 15th day of each calendar month, as the work progresses the Owner shall make partial payments to the Contractor on the value of labor and materials incorporated into the work and of materials on hand at the site of the work, except cement and materials subject to deterioration, for, and including the last day of the preceding month, less payments already made and less deductions for any unaccepted or defective work, in accordance with the terms set forth in Paragraph 25 of the General Conditions forming a part hereof.

5. Upon submission by the Contractor of evidence satisfactory to the Owner that all payrolls, material bills and other costs incurred by the Contractor in connection with the construction of the work have been paid in full, final payment on account of this Agreement shall be made within thirty (30) days after the completion by the Contractor of all work covered by this Agreement and the acceptance of such work by the Owner, all as provided for in Paragraph 8 of the

Supplemental General Conditions forming a part hereof.

6. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the Surety and Payment Bonds hereto attached for its faithful performance, the Owner shall deem the Surety or Sureties upon such bonds to be unsatisfactory, or if, for any reason, such bond ceases to be adequate to cover performance of the work, the Contractor shall, at his expense, within five (5) days after the receipt of notice from the Owner so to do, furnish additional bond or bonds in such form and amount and with such surety or sureties as shall be satisfactory to the Owner. In such event no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Owner.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the day, month and year first above written in six (6) counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original contract.

WITNESS: (As to Contractor)

Signed and Sealed in the Presence of:

Charles M Elkins

Billy R. Dykes

* CONTRACTOR

METRO PIPELINE COMPANY

By: Cecil M. Forbes Jr.
Cecil M. Forbes, Jr.

Title: President

ATTEST: (SEAL)

Mary R. Forbes
Secretary

ATTEST:

(SEAL)

(Secretary)

(SEAL)

A G Smith
(~~Recorder~~ Clerk)

BOARD OF MAYOR AND COUNCIL, CITY OF ATHENS, GEORGIA

By: Julius F. Bishop
(Mayor)

APPROVED AS TO FORM BEFORE EXECUTION

By: Jas J Wells
Attorney for the City of Athens, Georgia

* NOTE: If the Contractor is a corporation, the Agreement shall be signed by the President or Vice President, attested by the Secretary and the corporate seal affixed. If the Contractor is a partnership, the Agreement shall be signed in the Partnership name by one of the partners, with indication that he is a general partner.

PERFORMANCE BOND

CLARKE COUNTY)
) ss:
STATE OF GEORGIA)

KNOW ALL MEN BY THESE PRESENTS, that we, METRO PIPELINE COMPANY ______, hereinafter known as the "Contractor", as principal, and UNITED STATES FIDELITY AND GUARANTEE COMPANY, as surety, are held and firmly bound unto the City of Athens, Georgia, hereinafter known as the "Owner", in the penal sum of FIVE HUNDRED THOUSAND, THREE HUNDRED FIFTY-FOUR AND NO/100 -- Dollars ($ 500,354.00) lawful money of the United States of America, to be paid to the Owner, for the use and benefit of the said obligee, and of all persons doing work or furnishing skill, tools, machinery or materials under or for the purpose of the contract hereinafter named, for which payment, well and truly to be made, we bind ourselves, our successors and our several respective heirs, assigns, executors and administrators, jointly and severally, firmly by these presents.

SEALED WITH OUR SEALS AND DATED THIS THE 8th DAY OF August, 1969.

WHEREAS, the above bounden METRO PIPELINE COMPANY ______ by an instrument in writing, bearing even date, with these presents, has contracted with the Owner to furnish all equipment, tools, materials, skill and labor for the completion of the work covered by the following items of the attached Proposal for constructing Water System Improvements, to-wit: DIVISION ONE - ITEMS 1 THROUGH 30

All work to be performed in strict accordance with the attached Agreement or Contract and Specifications, which Contract is by reference made a part hereof:

NOW, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said METRO PIPELINE COMPANY shall complete the work provided for in said Contract according to the terms,

and shall save the obligee hereunder free from all costs and charges that may accrue on account of the doing of the work specified in the contract, and shall comply with the laws appertaining to said Contract, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

AND THE FURTHER CONDITION OF THIS OBLIGATION IS SUCH THAT IF METRO PIPELINE COMPANY, as Contractor shall fully and faithfully perform the work in accordance with the terms of the annexed contract therefor and the plans and specifications therein referred to, and provide the materials therein called for, and replace defective work or material for a period of one year after the completion of this contract, then this obligation shall be null and void; otherwise they, METRO PIPELINE COMPANY, as Contractor and UNITED STATES FIDELITY AND GUARANTEE COMPANY, as Surety, jointly and severally agree to pay the Owner the difference between the sum to which the said METRO PIPELINE COMPANY as Contractor, would be entitled in the completion of the Contract, and that which the Owner may be obliged to pay for the completion of the work by Contract, or otherwise, and agree to pay any damage, direct or indirect or consequential, which said Owner may sustain on account of such work or on account of the failure of said Contractor, properly and in all things to keep and execute the provisions of the Contract.

And the said METRO PIPELINE COMPANY as Contractor, and UNITED STATES FIDELITY AND GUARANTEE COMPANY as surety, hereby further bind themselves, their successors, assigns, heirs, executors and administrators, jointly and severally, that they will indemnify and save harmless and will pay all amounts, damages, costs and judgments which may be recovered against, and all expenses incurred by, the Owner and all representatives of said Owner from or arising out of all or any suits, actions, or claims of any character brought on account of any injuries or damages sustained by any persons or property in consequence of any neglect in safeguarding the work, or any such suit or claim arising from any other act, omission, negligence, or misconduct of the Contractor, his agents, representatives, servants and employees in the performance of said work or of the repair of maintenance thereof, or the manner of doing the same, or the neglect of said Contractor, or agents or servants, or the improper performance of the said work by the Contractor or agents or servants, or the infringement of any patent rights by reason of the use of any equipment or materials furnished under the said Contract, and will also pay any damages for delay in performance within the time agreed, and stated in the Contract; further, failure so to do with such persons, firms, partnerships or corporation shall give them a direct right of action against the principal and surety under this obligation.

As the said surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder, or the specifications accompanying the same, shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or

addition to the terms of the Contract or to the work or to the Specifications.

Without limiting the effect of any other provisions herein contained, this Bond is to be construed as a statutory bond under the provisions of Section 23-1705 of the 1933 Code of Georgia as amended to date.

IN WITNESS WHEREOF, the said METRO PIPELINE COMPANY has caused ITS corporate seal to be hereto affixed, and these presents to be signed in its name by CECIL M. FORBES, JR. and the said UNITED STATES FIDELITY AND GUARANTEE COMPANY as surety, has caused ITS corporate seal to be hereto affixed and these presents to be signed in its name by C. R. NELMS.

(As to Contractor)

Signed, sealed and delivered in the presence of:

Charles M. Elkins

Billy R. Dykes

*CONTRACTOR (SEAL)

METRO PIPELINE COMPANY

By: Cecil M. Forbes Jr - Pres.
(Name) (Title)

ATTEST

Mary R. Forbes
(Secretary)

(As to Surety)

Signed, sealed and delivered in the presence of:

SURETY (SEAL)

UNITED STATES FIDELITY AND GUARANTY CO.

By: C. Nelms
CHARLES R. NELMS
BENNETT & EDWARDS AGENCY, INC.
KINGSPORT, TENNESSEE
Attorney in Fact

APPROVED AS TO FORM:

Davis
City Attorney

COUNTERSIGNED:

By:
Resident Agent
(Resident of Clarke County)

(NOTE: If the Principal is a corporation, the bond shall be signed by the President or a Vice-President, attested by the Secretary and the corporate seal affixed. If the Principal is a partnership, the bond shall be signed in the partnership name by one of the partners, with indication that he is a general partner.)

PAYMENT BOND

CLARKE COUNTY)
) ss:
STATE OF GEORGIA)

KNOW ALL MEN BY THESE PRESENTS, that we, METRO PIPELINE Company

____, hereinafter known as the

"Contractor", as principal, and UNITED STATES FIDELITY AND GUARANTEE COMPANY as surety, are held and firmly bound unto the City of Athens, Georgia hereinafter known as the "Owner", in the penal sum of FIVE HUNDRED THOUSAND, THREE HUNDRED FIFTY-FOUR AND NO/100 ---------------------- Dollars ($500,354.00) lawful money of the United States of America, to be paid to the Owner, for the use and benefit of the said obligee, and of all persons doing work or furnishing skill, tools, machinery, or materials under or for the purpose of the Contract hereinafter named, for which payment, well and truly to be made, we bind ourselves, our successors and our several respective heirs, assigns, executors and administrators, jointly and severally, firmly by these presents.

SEALED WITH OUR SEALS AND DATED THIS THE 8th DAY OF August, 1969.

WHEREAS, the above bounden METRO PIPELINE COMPANY

____ by an instrument in writing, bearing even date, with these presents, has contracted with the Owner to furnish all equipment, tools, materials, skill and labor for the completion of the work covered by the following items of the attached Proposal for constructing Water System Improvements, to-wit: DIVISION ONE - ITEMS 1 THROUGH 30

____

____

____

All work to be performed in strict accordance with the attached Agreement or Contract and Specifications, which Contract is by reference made a part hereof:

NOW, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said METRO PIPELINE COMPANY and all subcontractors to whom any portion of the work provided for in the attached Agreement or Contract is sublet and all assignees of the said METRO PIPELINE COMPANY and of such subcontractors shall promptly make payments to all persons supplying him or them with labor, materials, or supplies for or in the prosecution of the work provided for in such Contract, or in any amendment or extension of or addition to said Contract, and for the payment of reasonable attorneys fees, incurred by the claimant or claimants in suits on said bond, then the above obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, however, that this bond is subject to the following conditions and limitations:

(a) Any person, firm or corporation that has furnished labor, materials or supplies for or in the prosecution of the work provided for in said Contract shall have a direct right of action against the Contractor and Surety on this bond, which right of action shall be asserted in a proceeding, instituted in the county in which the work provided for in said contract is to be performed or in any County in which said Contractor or Surety does business. Such right of action shall be asserted in a proceeding, institued in the name of the claimant or caliments for his or their use and benefit against said Contractor and Surety or either of them (but not later than one year after the final settlement of said Contract) in which action such claim or claims shall be adjudicated and judgment rendered thereon.

(b) The Principal and Surety hereby designate and appoint the CITY CLERK OF ATHENS, GEORGIA as the agent of each of them to receive and accept service of process or other pleading issued or filed in any proceeding instituted on this bond and hereby consent that such service shall be the same as personal service on the Contractor and/or Surety.

(c) In no event shall the Surety be liable for a greater sum that the penalty of this bond, or subject to any suit, action or proceeding thereon that is instituted later than one year after the final settlement of said Contract.

(d) This bond is given pursuant to the terms of Section 23-1705 of the 1933 Code of Georgia as amended as all the provisions of law with reference to this character of bond as set forth in said section or as may hereinafter be enacted are hereby made a part hereof to the same extent as if set out herein in full.

IN WITNESS WHEREOF, the said METRO PIPELINE COMPANY

_______________ has caused ITS corporate seal to be hereto affixed,

and these presents to be signed in its name by _______________

CECIL M. FORBES, JR.

and the said UNITED STATES FIDELITY AND GUARANTEE COMPANY

_______________ as surety, has caused ITS corporate seal to be

hereto affixed and these presents to be signed in its name by C. R. NELMS

_______________.

(As to Contractor)

Signed, sealed and delivered
in the presence of:

Charles M. Elkins

Billy R. Dykes

*CONTRACTOR (SEAL)

METRO PIPELINE COMPANY

By: Cecil M. Forbes Jr. - Pres
(Name) (Title)

ATTEST:

Mary R. Forbes
Secretary

(As to Surety)

Signed, sealed and delivered
in the presence of:

SURETY: (SEAL)

UNITED STATES FIDELITY AND GUARANTY CO.

By: C. Nelms
Attorney in Fact

CHARLES R. NELMS
BENNETT & EDWARDS AGENCY, IN
KINGSPORT, TENNESSEE

APPROVED AS TO FORM:

City Attorney

COUNTERSIGNED:

By: L. L. Scruggs
Resident Agent
(Resident of Clarke County)

*(NOTE: If the Principal is a corporation, the bond shall be signed by the President or a Vice-President, attested by the Secretary and the corporate seal affixed. If the Principal is a partnership, the bond shall be signed in the partnership name by one of the partners, with indication that he is a general partner.)

FORM ED-119
(7-10-68)

Budget Bureau No. 41-R2433
Approval Expires June 30, 1969

U.S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY

GENERAL

In accordance with Executive Order 11246 (30 F.R. 12319-25), the implementing rules and regulations thereof, and orders of the Secretary of Labor, a Certification regarding Equal Opportunity is required of bidders or prospective contractors and their proposed subcontractors prior to the award of contracts or subcontracts.

CERTIFICATION OF BIDDER

Bidder's Name METRO PIPELINE COMPANY

Address 2823 VINEVILLE AVENUE, MACON, GEORGIA 31204

1. Participation in a previous contract or subcontract.

a. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. . . . . ☐ Yes ☒ No

b. Compliance reports were required to be filed in connection with such contract or subcontract . . . . ☐ Yes ☐ No

c. If "Yes," Bidder has filed all compliance reports due under applicable instructions. . . . . ☐ Yes ☐ No

d. If answer to item **c** is "No," please explain in detail on reverse side of this certification.

NOTE: Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

2. Nonsegregated facilities

a. Notice to Prospective Federally-Assisted Construction Contractors

(1) A Certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a federally-assisted construction contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause.

(2) Contractors receiving federally-assisted construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause:

b. Notice to Prospective Subcontractors of Requirement for Certification of Nonsegregated Facilities

(1) A Certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause.

(2) Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause.

c. Certification of Nonsegregated facilities

The federally-assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The federally-assisted construction contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

REMARKS:

Certification - The information above is true and complete to the best of my knowledge and belief.

CECIL M. FORBES, JR. - PRESIDENT

Name and title of signer *(Please type)*

Cecil M. Forbes Jr.

Signature

JUNE 12, 1969

Date

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

FORM ED-120
(7-10-68)

Budget Bureau No. 41-R2434
Approval Expires June 30, 1969

U.S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

CERTIFICATION BY PROPOSED SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

Name of Prime Contractor ____________________ Project No. ____________

GENERAL

In accordance with Executive Order 11246 (30 F.R. 12319-25), the implementing rules and regulations thereof, and orders of the Secretary of Labor, a Certification regarding Equal Opportunity is required of bidders or prospective contractors and their proposed subcontractors prior to the award of contracts or subcontracts.

SUBCONTRACTOR'S CERTIFICATION

Subcontractor's Name ____________________

Address ____________________

1. Participation in a previous contract or subcontract.

a. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. . . . . ☐ Yes ☐ No

b. Compliance reports were required to be filed in connection with such contract or subcontract . . . . ☐ Yes ☐ No

c. If "Yes," Bidder has filed all compliance reports due under applicable instructions . . . . ☐ Yes ☐ No

d. If answer to item c is "No," please explain in detail on reverse side of this certification.

NOTE: Where the certification indicates that the subcontractor has not filed a compliance report due under applicable instructions, such subcontractor shall be required to submit a compliance report before the owner approves the subcontract or permits work to begin under the subcontract.

2. Nonsegregated facilities.

a. Notice to Prospective Subcontractors of Requirement for Certification of Nonsegregated Facilities

(1) A Certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause.

(2) Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause.

EXHIBIT Q

b. Certification of Nonsegregated facilities

The federally-assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The federally-assisted construction contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

REMARKS:

Certification - The information above is true and complete to the best of my knowledge and belief.

____
Name and title of signer *(Please type)*

____________________ ____________________
Signature Date

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

FORM ED-126
5-6-66

U.S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

CERTIFICATE OF GRANTEE/BORROWER'S ATTORNEY

I, the undersigned, Jos J Bacig., the duly authorized and acting legal representative of the Mayor & Council of the City of [illegible], do hereby certify as follows:

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

Jos J Bacig.

Date: Aug 8, 1969

USCOMM-DC 56012-P66

GENERAL CONDITIONS

U. S. DEPARTMENT OF COMMERCE

Economic Development Administration
Construction Management Division

August 25, 1967

GENERAL CONDITIONS

1. Contract and Contract Documents
2. Definitions
3. Additional Instructions and Detail Drawings
4. Shop or Setting Drawings
5. Materials, Services and Facilities
6. Contractor's Title to Materials
7. Inspection and Testing of Materials
8. "Or Equal" Clause
9. Patents
10. Surveys, Permits, Regulations
11. Contractor's Obligations
12. Weather Conditions
13. Protection of Work and Property
14. Inspection
15. Reports, Records and Data
16. Superintendence by Contractor
17. Changes in Work
18. Extras
19. Time for Completion and Liquidated Damages
20. Correction of Work
21. Subsurface Conditions Found Different
22. Claims for Extra Costs
23. Right of Owner to Terminate Contract
24. Construction Schedule and Periodic Estimates
25. Payments to Contractor
26. Acceptance of Final Payment As Release
27. Payments by Contractor
28. Contractor's and Subcontractors' Insurance
29. Contract Security
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31. Assignments
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37. Use of Premises and Removal of Debris
38. Quantities of Estimate
39. Land and Rights-of-Way
40. General Guaranty

41. Conflicting Conditions

42. Notice and Service Thereof

43. Required Provisions Deemed Inserted

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45. Minimum Wages

46. Withholding of Payments

47. Payrolls and Basic Records

48. Apprentices

49. Compliance with Copeland Regulations

50. Subcontracts

51. Contract Termination

52. Overtime Requirements

53. Equal Employment Opportunity

54. Interest on Federal, State or Local Officials

55. Other Prohibited Interests

56. Signs

57. Use and Occupancy Prior to Acceptance by Owner

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59. Employment of Local Labor

60. Anti-Kickback Provisions

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1. CONTRACT AND CONTRACT DOCUMENTS

The Plans, Specifications and Addenda, hereinafter enumerated in Paragraph 1 of the Supplemental General Conditions, shall form part of the Contract, and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

2. DEFINITIONS

The following terms as used in these General Conditions are respectively defined as follows:

(a) "Contractor": A person, firm or corporation with whom this Contract is made by the Owner. (The Owner is referred to by EDA, in other documents, as the Grantee/Borrower).

(b) "Subcontractor": A person, firm or corporation supplying labor and materials or only labor for work at the site of the project for, and under separate contract or agreement with, the Contractor.

(c) "Work on (at) the project": Work to be performed at the location of the project, including the transportation of materials and supplies to or from the location of the project by employees of the Contractor and any Subcontractor.

3. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the contract.

The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions. The Contractor and the Architect/Engineer will prepare jointly (a) a schedule, fixing the dates at which special detail drawings will be required, such drawings, if any, to be furnished by the Architect/Engineer in accordance with said schedule, and (b) a schedule fixing the respective dates for the submission of shop drawings, the beginning of manufacture testing and installation of materials, supplies and equipment, and the completion of the various parts of the work; each such schedule to be subject to change from time to time in accordance with the progress of the work.

4. SHOP OR SETTING DRAWINGS

The Contractor shall submit promptly to the Architect/Engineer two copies of each shop or setting drawing prepared in accordance with the schedule predetermined as aforesaid. After examination of such drawings by the Architect/Engineer and the return thereof, the Contractor shall make such corrections to the drawings as have been indicated and shall furnish the Architect/Engineer with two corrected copies. Regardless of corrections made in or approval given to such drawings by the Architect/Engineer, the Contractor will nevertheless be responsible for the accuracy of such drawings and for their conformity to the Plans and Specifications, unless he notifies the Architect/Engineer, in writing, of any deviations at the time he furnishes such drawings.

5. MATERIALS, SERVICES AND FACILITIES

(a) It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

(b) Any work necessary to be performed after regular hours, on Sundays or Legal Holidays, shall be performed without additional expense to the Owner.

6. CONTRACTOR'S TITLE TO MATERIALS

No materials or supplies for the work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the work, free from all liens, claims or encumbrances.

7. INSPECTION AND TESTING OF MATERIALS

(a) All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Owner. The Owner will pay for all laboratory inspection service direct, and not as a part of the Contract.

(b) Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for users intended.

8. "OR EQUAL" CLAUSE

Whenever a material, article or piece of equipment is identified on the plans or in the specifications by reference to manufacturers' or vendors' names, tradenames, catalogue numbers, etc., it is intended merely to establish a standard; and, any material, article, or equipment of other manufacturers and vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed, is, in the opinion of the Architect/Engineer, of equal substance and function. It shall not be purchased or installed by the Contractor without the Architect/Engineer's written approval.

9. PATENTS

(a) The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.

(b) License or Royalty Fee: License and/or Royalty Fees for the use of a processwhich is authorized by the Owner of the project must be reasonable, and paid to the holder of the patent, or his authorized licensee, direct by the Owner and not by or through the Contractor.

(c) If the Contractor uses any design, device or materials covered by letters, patent or copyright, he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood that, without exception, the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his Sureties shall indemnify and save harmless the Owner of the Project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

10. SURVEYS, PERMITS AND REGULATIONS

Unless otherwise expressly provided for in this contract, the Owner will furnish to the Contractor all surveys necessary for the execution of the work. The Contractor shall procure and pay for all permits, licenses and approvals necessary for the execution of his contract.

The Contractor shall comply with all laws, ordinances, rules, orders, and regulations relating to the performance of the work, the protection of adjacent property, and the maintenance of passageways, guard fences or other protective facilities.

11. CONTRACTOR'S OBLIGATIONS

The Contractor shall and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this contract, within the time herein specified, in accordance with the provisions of this contract and said specifications and in accordance with the plans and drawings covered by this contract and any and all supplemental plans and drawings, and in accordance with the directions of the Architect/Engineer as given from time to time during the progress of the work. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the contract and specifications, and shall do, carry on, and complete the entire work to the satisfaction of the Architect/Engineer and the Owner.

12. WEATHER CONDITIONS

In the event of temporary suspension of work, or during inclement weather, or whenever the Architect/Engineer shall direct, the Contractor will, and will cause his subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Architect/Engineer, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors to so protect his work, such materials shall be removed and replaced at the expense of the Contractor.

13. PROTECTION OF WORK AND PROPERTY - EMERGENCY

The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this contract. He shall at all times safely guard and protect his own work, and that of adjacent property, from damage. The Contractor shall replace or make good any such damage, loss or injury unless such be caused directly by errors contained in the contract or by the Owner, or his duly authorized representative.

In case of an emergency which threatens loss or injury of property, and/or safety of life, the Contractor will be allowed to act, without previous instructions from the Architect/Engineer, in a diligent manner. He shall notify the Architect/Engineer immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the Architect/Engineer for approval.

Where the Contractor has not taken action but has notified the Architect/Engineer of an emergency threatening injury to persons or damage to the work or any adjoining property, he shall act as instructed or authorized by the Architect/Engineer.

The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in Paragraph 17 of the General Conditions.

14. INSPECTION

The authorized representatives and agents of the Economic Development Administration shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.

15. REPORTS, RECORDS AND DATA

The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

16. SUPERINTENDENCE BY CONTRACTOR

At the site of the work the Contractor shall employ a construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Architect/Engineer.

17. CHANGES IN WORK

No changes in the work covered by the approved contract documents shall be made without having prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following methods:

(a) Unit bid prices previously approved.
(b) An agreed lump sum.
(c) The actual cost of:
    (1) Labor, including foremen;
    (2) Materials entering permanently into the work;
    (3) The Ownership or rental cost of construction plant and equipment during the time of use on the extra work;
    (4) Power and consumable supplies for the operation of power equipment;

(5) Insurance;

(6) Social Security and old age and unemployment contributions.

To the cost under (c) there shall be added a fixed fee to be agreed upon but not to exceed fifteen percent (15%) of the estimated cost of the work. The fee shall be compensation to cover the cost of supervision, overhead, bond, profit and any other general expenses.

18. EXTRAS

Without invalidating the contract, the Owner may order extra work of the kind bid upon or make changes by altering, adding to or deducting from the work, the contract sum being adjusted accordingly, and the consent of the Surety being first obtained where necessary or desirable. All the work of the kind bid upon shall be paid for at the price stipulated in the proposal, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner or its Architect/Engineer, acting officially for the Owner, and the price is stated in the order.

19. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the Contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the Notice to Proceed.

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

If the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the Owner the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; Provided further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

(a) To any preference, priority or allocation order duly issued by the Government;

(b) To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather; and

(c) To any delays of subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article; Provided, further, that the Contractor shall, within ten (10) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

20. CORRECTION OF WORK

All work, all materials, whether incorporated in the work or not, all processes of manufacture, and all methods of construction shall be at all times and places subject to the inspection of the Architect/Engineer who shall be the final judge of the quality and suitability of the work, materials, processes of manufacture, and methods of construction for the purposes for which they are used. Should they fail to meet his approval they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the Contractor at his own expense. Rejected material shall immediately be removed from the site. If, in the opinion of the Architect/Engineer, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the Contract Documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as in the judgment of the Architect/Engineer shall be equitable.

21. SUBSURFACE CONDITIONS FOUND DIFFERENT

Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the Plans or indicated in the Specifications, he shall immediately give notice to the Architect/Engineer of such conditions before they are disturbed. The Architect/Engineer will thereupon promptly investigate the conditions, and if he finds that they materially differ from those shown on the Plans or indicated in the Specifications, he will at once make such changes in the Plans and/or Specifications as he may find necessary, and any increase or decrease of cost resulting from such changes to be adjusted in the manner provided in Paragraph 17 of the General Conditions.

22. CLAIMS FOR EXTRA COSTS

No claim for extra work or cost shall be allowed unless the same was done in pursuance of a written order of the Architect/Engineer approved by the Owner, as aforesaid, and the claim presented with the first estimate after the changed or extra work is done. When work is performed under the terms of subparagraph 17 (c) of the General Conditions, the Contractor shall furnish satisfactory bills, payrolls, and vouchers covering all items of cost and,when requested by the Owner, give the Owner access to accounts relating thereto.

23. RIGHT OF THE OWNER TO TERMINATE CONTRACT

In the event that any of the provisions of this contract are violated by the Contractor, or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the contract, such notices to contain the reasons for such intention to terminate the contract, and unless within ten (10) days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement or correction be made, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination the Owner shall immediately serve notice thereof upon the Surety and the Contractor, and the Surety shall have the right to take over and perform the contract; Provided, however, that if the Surety does not commence performance thereof within ten (10) days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor,and the Contractor and his Surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefor.

24. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

Immediately after execution and delivery of the contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule. The Contractor shall also furnish on forms to be supplied by the Owner (a) a detailed estimate giving a complete breakdown of the contract price and (b) periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

25. PAYMENT TO CONTRACTOR

(a) Not later than the 15th day of each calendar month the Owner shall make a Progress payment to the Contractor on the basis of a duly certified and approved estimate of the work performed during the preceding calendar month under this contract, but to insure the proper performance of this contract, the Owner shall retain ten percent (10%) of the amount of each estimate until final completion and acceptance of all work covered by this contract.

(b) In preparing estimates the material delivered on the site and preparatory work done may be taken into consideration.

(c) All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the contract.

(d) Owner's Right to Withhold Certain Amounts and Make Application Thereof:

The Contractor agrees that he will idemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have to be paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills, of which the Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his Surety.

In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner, shall be considered as a payment made under the contract by the Owner to the Contractor,and the Owner shall not be liable to the Contractor for any such payment made in good faith.

26. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor for all things done or furnished in connection with this work and for every act and neglect of the Owner and others relating to or arising out of this work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this contract or the Performance and Payment Bond.

27. PAYMENTS BY CONTRACTOR

The Contractor shall pay (a) for all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered, (b) for all materials, tools, and other expendable equipment to the extent of 90% of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the project, and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used, and (c) to each of his subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors to the extent of each subcontractor's interest therein.

28. CONTRACTOR'S AND SUBCONTRACTORS' INSURANCE

The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until the insurance required of the subcontractor has been so obtained and approved.

(a) Compensation Insurance: The Contractor shall procure and shall maintain during the life of this contract Workmen's Compensation Insurance as required by applicable State or territorial law for all of his employees to be engaged in work at the site of the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this contract is not protected under the Workmen's Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

(b) Contractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance:

The Contractor shall procure and shall maintain during the life of this contract Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance in the amounts specified in Paragraph 4 of the Supplemental General Conditions.

(c) Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance:

The Contractor shall either (1) require each of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance of the type and in the amounts specified in Paragraph 4 of the Supplemental General Conditions specified in subparagraph (b) hereof, or, (2) insure the activities of his subcontractors in his policy, specified in subparagraph (b) hereof.

(d) Scope of Insurance and Special Hazards: The insurance required under subparagraphs (b) and (c) hereof shall provide adequate protection for the Contractor and his subcontractors, respectively, against damage claims which may arise from operations under this contract, whether such operations be by the insured or by any one directly or indirectly employed by him and, also against any of the special hazards which may be encountered in the performance of this contract as enumerated in Paragraph 3 of the Supplemental General Conditions.

(e) Builder's Risk Insurance (Fire and Extended Coverage): The Contractor shall procure and shall maintain during the life of this contract Builder's Risk Insurance (Fire and extended Coverage) on a 100 percent (100%) completed value basis on the insurable portion of the project. The owner, the contractor, and subcontractors (as their interests may appear) shall be named as the Insured.

(f) Proof of Carriage of Insurance: The Contractor shall furnish the owner with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. Such certificates shall also contain substantially the following statements: "The insurance covered by this certificate will not be cancelled or materially altered, except after ten (10) days written notice has been received by the Owner."

29. The Contractor shall furnish a performance bond in an amount at least equal to one hundred percent (100%) of the contract prices as security for the faithful performance of this contract and also a payment bond in an amount not less than fifty percent (50%) of the contract price or in a penal sum not less than that prescribed by State, territorial or local law, as security for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract. The performance bond and the payment bond may be in one or in separate instruments in accordance with local law. Before final acceptance each bond must be approved by the Economic Development Administration.

30. ADDITIONAL OR SUBSTITUTE BOND

If at any time the Owner for justifiable cause, shall be or become dissatisfied with the surety or sureties for the Performance and/ or Payment Bonds, the Contractor shall within five (5) days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished such an acceptable bond to the Owner.

31. ASSIGNMENTS

The Contractor shall not assign the whole or any part of this contract or any moneys due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any moneys due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

32. MUTUAL RESPONSIBILITY OF CONTRACTORS

If, through acts of neglect on the part of the Contractor, any other Contractor or any subcontractor shall suffer loss of damage on work, the Contractor agrees to settle with such other Contractor or subcontractor by agreement or arbitration if such other Contractor or subcontractors will so settle. If such other Contractor or subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

33. SEPARATE CONTRACTS

The Contractor shall coordinate his operations with those of other Contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his subcontractors, shall keep informed of the progress and the detail work of other Contractors and shall notify the Architect/Engineer immediately of lack of progress or defective workmanship on the part of other Contractors. Failure of a Contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

34. SUBCONTRACTING

(a) The Contractor may utilize the services of specialty Subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty Subcontractors.

(b) The Contractor shall not award any work to any subcontractor without prior written approval of the Owner, which approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the subcontractor, which statement will contain such information as the Owner may require.

(c) The Contractor shall be as fully responsible to the Owner for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

(d) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and other contract documents insofar as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the contract documents.

(e) Nothing contained in this contract shall create any contractual relation between any subcontractor and the Owner.

35. ARCHITECT/ENGINEER AUTHORITY

The Architect/Engineer shall give all orders and directions contemplated under this contract and specifications relative to the execution of the work. The Architect/Engineer shall determine the amount, quality, acceptability, and fitness of the several kinds of work and materials which are to be paid for under this contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Architect /Engineer's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any question shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Architect/Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.

The Architect/Engineer shall decide the meaning and intent of any portion of the specifications and of any plan or drawings where the same may be found obscure or be in dispute. Any differences or conflicts in regard to their work which may arise between the Contractor under this contract and other Contractors performing work for the Owner shall be adjusted and determined by the Architect/Engineer.

36. STATED ALLOWANCES

The Contractor shall include in his proposal the cash allowances stated in Paragraph 2 of the Supplemental General Conditions. The Contractor shall purchase the "Allowed Materials" as directed by the Owner on the basis of the lowest and best bid of at least three competitive bids. If the actual price for purchasing the "Allowed Materials" is more or less than the "Cash Allowance", the contract price shall be adjusted accordingly. The adjustment in contract price shall be made on the basis of the purchase price without additional charges for overhead, profit, insurance or any other incidental expenses. The cost of installation of the "Allowed Materials" shall be included in the applicable sections of the Contract Specifications covering this work.

37. USE OF PREMISES AND REMOVAL OF DEBRIS

The Contractor expressly undertakes at his own expense:

(a) to take every precaution against injuries to persons or damage to property;

(b) to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any other contractors;

(c) To place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work;

(d) To clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the work shall present a neat, orderly and workmanlike appearance;

(e) before final payment to remove all surplus material, falsework, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in a neat, orderly condition;

(f) to effect all cutting, fitting or patching of his work required to make the same to conform to the plans and specifications and, except with the consent of the Architect/Engineer, not to cut or otherwise alter the work of any other Contractor.

38. QUANTITIES OF ESTIMATE

Wherever the estimated quantities of work to be done and materials to be furnished on a unit price basis under this contract are shown in any of the documents including the proposal, they are given for use in comparing bids, and the right is expressly reserved, except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this contract, and such increase or diminution shall in no way vitiate this contract, nor shall any such increase or diminution give cause for claims or liability for damages.

39. LAND AND RIGHTS-OF-WAY

Prior to the start of construction, the Owner shall obtain all land rights-of-way necessary for the carrying out and completion of work to be performed under this contract.

40. GENERAL GUARANTY

Neither the final certificate of payment nor any provision in the Contract Documents nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final acceptance of work unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness.

41. CONFLICTING CONDITIONS

Any provision in any of the Contract Documents which may be in conflict or inconsistent with any of the paragraphs in these General Conditions shall be void to the extent of such conflict or inconsistency.

42. NOTICE AND SERVICE THEREOF

Any notice to any Contractor from the Owner relative to any part of this contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted, by certified or registered mail, to the said Contractor at his last given address, or delivered in person to said Contractor or his authorized representative on the work.

43. REQUIRED PROVISIONS DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the contract shall forthwith be physically amended to make such insertion or correction.

44. PROTECTION OF LIVES AND HEALTH

In order to protect the lives and health of his employees under the contract, the Contractor shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the contract.

The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation.

45. MINIMUM WAGES

(a) All mechanics and laborers employed or working upon the site of the work, or under the United States Housing Act of 1937, or under the Housing Act of 1949 in the construction or development of the project, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amounts due at time of payment computed at wage rates not less than those contained in the wage determination decision of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and subcontractor and such laborers and mechanics; and the wage determination decision shall be posted by the contractor at the site of the work in a prominent place where it can be easily seen by the workers. For the purpose of this clause, contributions made or costs reasonably anticipated under section 1 (b) (2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5 (a) (1) (iv).

Also for the purpose of this clause, regular contributions made or costs incurred for more than a weekly period under plans, funds, or programs, but covering the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

(b) The Owner shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract, shall be classified or reclassified conformably to the wage determination, and a report of the action taken shall be sent by the Federal agency to the Secretary of Labor. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question accompanied by the recommendation of the Owner shall be referred to the Secretary for final determination.

(c) The Owner shall require whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly wage rate and the contractor is obligated to pay a cash equivalent of such a fringe benefit, an hourly cash equivalent thereof to be established. In the event the interested parties cannot agree upon a cash equivalent of the fringe benefit, the question, accompanied by the recommendation of the Owner, shall be referred to the Secretary of Labor for determination.

(d) If the Contractor does not make payments to a trustee or other third person, he may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing benefits under a plan or program of a type expressly listed in the wage determination decision of the Secretary of Labor which is a part of this contract; provided, however, the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

46. WITHHOLDING OF PAYMENTS

The Economic Development Administration may withhold or cause to be withheld from the Contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics employed by the Contractor or any Subcontractor on the work the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic employed or working on the site of the work, or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project, all or part of the wages required by the contract, the Economic Development Administration may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

47. PAYROLLS AND BASIC RECORDS

(a) Payrolls and basic records relating thereto will be maintained during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work, or under the United States Housing Act of 1937 or under the Housing Act of 1949, in the construction or development of the project. Such records will contain the name and address of each employee, his correct classification, rates of pay (including rates of contributions or costs anticipated of the types described in section 1 (b) (2) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a) (1) (iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan program described in section 1 (b) (2) (B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(b) The Contractor will submit weekly a copy of all payrolls to the Economic Development Administration if the agency is a party to the contract, but if the agency is not such a party the Contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Economic Development Administration. The copy shall be accompanied by a statement signed by the employer or his agent indicating that the payrolls are correct and complete, that the wage rates contained therein are not less than those determined by the Secretary of Labor and that the classifications set forth for each laborer or mechanic conform with the work he performed. A submission of a "Weekly Statement of Compliance" which is required under this contract and the Copeland regulations of the Secretary of Labor (29 CFR Part 3) and the filing with the initial payroll or any subsequent payroll of a copy of any findings by the Secretary of

Labor under 29 CFR 5.5 (a) (1) (iv) shall satisfy this requirement. The Prime Contractor shall be responsible for the submission of copies of payrolls of all Subcontractors. The Contractor will make the records required under the labor standards clause of the contract available for inspection by authorized representatives of the Economic Development Administration and the Department of Labor, and will permit such representatives to interview employees during working hours on the job.

48. APPRENTICES

Apprentices will be permitted to work as such only when they are registered, individually, under a bona fide apprenticeship program registered with a State apprenticeship agency which is recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or, if no such recognized agency exists in a State, under a program registered with the Bureau of Apprenticeship and Training, United States Department of Labor. The allowance ratio of apprentices to journeymen in any craft classification shall not be greater than the ratio permitted to the Contractor as to his entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered as above, shall be paid the wage rate determined by the Secretary of Labor for the classification of work he actually performed. The Contractor or Subcontractor will be required to furnish to the Owner written evidence of the registration of his program and apprentices as well as of the appropriate ratios and wage rates, for the area of construction prior to using any apprentices on the contract work.

49. COMPLIANCE WITH COPELAND REGULATIONS

The Contractor shall comply with the Copeland Regulations (29 CFR Part 3) of the Secretary of Labor which are herein incorporated by reference.

50. SUBCONTRACTORS

The Contractor will insert in any subcontracts the clauses contained in 29 CFR 5.5 (a) (1) through (5) and (7) and such other clauses as the Economic Development Administration may by appropriate instructions require, and also a clause requiring the Subcontractors to include these clauses in any lower tier subcontracts which they may enter into, together with a clause requiring this insertion in any further subcontracts that may in turn be made.

51. CONTRACT TERMINATION

A breach of Sections 45 through 50 may be grounds for termination of the contract, and for debarment as provided in 29 CFR 5.6.

52. OVERTIME REQUIREMENTS

(a) No Contractor or Subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any laborer or mechanic in any workweek in which he is employed on such work to work in excess of eight hours in any calendar day or in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all hours worked in excess of eight hours in any calendar day or in excess of forty hours in such workweek, as the case may be.

(b) In the event of any violation of the clause set forth in subsection (a), the Contractor and any Subcontractor responsible therefor shall be liable to any affected employee for his unpaid wages. In addition, such Contractor and Subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of the clause set forth in subsection (a), in the sum of $10.00 for each calendar day on which such employee was required or permitted to work in excess of eight hours or in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in subsection (a).

(c) The Economic Development Administration may withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or Subcontractor, such sums as may administratively be determined to be necessary to satisfy any liabilities of such Contractor or Subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subsection (b).

(d) The Contractor shall insert in all subcontracts the clause set forth in subsections (a), (b), and (c) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts which they may enter into, together with a clause requiring this insertion in any further subcontracts that may in turn be made.

53. EQUAL EMPLOYMENT OPPORTUNITY

(a) No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. Title VI of the Civil Rights Act of 1964 (42USC 2000d).

(b) Form EDA 503: The Recipient and all contractors, subcontractors, suppliers, lessees and other parties directly participating in the Recipient's project agree that during and in connection with the associated agreement relating to the Federally assisted program, (i) they will comply, to the extent applicable, as contractors, subcontractors, lessees, suppliers, or in any other capacity, with the applicable provisions of the Regulations of the United States Department of Commerce (Part 8 of Subtitle A of Title 15 of the Code of Federal Regulations) issued pursuant to Title VI of the Civil Rights Act of 1964 (P. L. 88-352), and will not thereby discriminate against any person on the grounds of race, color, or national origin in their employment practices, in any of their own contractual arrangements, in all services or accommodations which they offer to the public, and in any of their other business operations, (ii) they will provide information required by or pursuant to said Regulations to ascertain compliance with the Regulations and these assurances, and (iii) their non-compliance with the nondiscrimination requirements of said Regulations and these assurances shall constitute a breach of their contractual arrangements with the Recipient whereby said agreements may be cancelled, terminated or suspended in whole or in part or may be subject to enforcement otherwise by appropriate legal proceedings.

(c) Executive Order 11246, 30 Fed. Reg. 12319 (1965) (Equal Opportunity Clause): During the performance of this contract, the contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The contractor will take affirmative action to ensure the applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

The contractor agrees to post in conspicuous places available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this non-discrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, record, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders. Each contractor and subcontractor of Federally financed construction work is required to file an Equal Employment Opportunity Employer Information Report (EEO-1 on Standard Form 100) annually on March 31. Forms and instructions are available at the EDA Area Office.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246

of September 24, 1965, and such other sanctions may be imposed and remedies involved as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontractor or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance; Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

(d) Exemptions to Above Equal Opportunity Clause (41 CFR Chap. 60)

(1) Contracts and subcontracts not exceeding $10,000 (other than Government bills of lading) are exempt. The amount of the contract, rather than the amount of the Federal financial assistance, shall govern in determining the applicability of this exemption.

(2) Except in the case of subcontractors for the performance of construction work at the site of construction, the clause shall not be required to be inserted in subcontracts below the second tier.

(3) Contracts and subcontracts not exceeding $100,000 for standard commercial supplies or raw materials are exempt.

54. INTEREST OF FEDERAL, STATE OR LOCAL OFFICIALS

No Federal, State or Local official shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

55. OTHER PROHIBITED INTERESTS

No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part hereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

56. SIGNS

The General contractor will erect and maintain in good condition, a project sign furnished by the EDA identifying the project and indicating that the Government is participating in the development of the project. The dimensions of the sign will be 4 feet by 8 feet.

57. USE AND OCCUPANCY PRIOR TO ACCEPTANCE BY OWNER

The Contractor agrees to the use and occupancy of a portion or unit of the project before formal acceptance by the owner, provided the Owner:

(a) secures written consent of the contractor except in the event, in the opinion of the Architect/Engineer, the Contractor is chargeable with unwarranted delay in completing the contract requirements;

(b) secures consent of the surety;

(c) secures endorsement from the insurance carrier(s) permitting occupancy of the building or use of the project during the remaining period of construction; or

(d) when the project consists of more than one building, and one of the buildings is occupied, secures permanent fire and extended coverage insurance, including a permit from the insurance carrier to complete construction.

58. SUSPENSION OF WORK

Should the Owner be prevented or enjoined from proceeding with work or from authorizing its prosecution either before or after its prosecution, by reason of any litigation, the contractor shall not be entitled to make or assert claim for damage by reason of said delay, but time for completion of the work will be extended to such reasonable time as the Owner may determine will compensate for time lost by such delay with such determination to be set forth in writing.

59. EMPLOYMENT OF LOCAL LABOR

a. The maximum feasible employment of local labor shall be made in the construction of public works and development facility projects receiving direct Federal grants. Accordingly, every contractor and subcontractor undertaking to do work on any such project which is or reasonably may be done as on-site work, shall employ, in carrying out such contract work, qualified persons who regularly reside in the designated area where such project is to be located, or in the case of economic development centers, qualified persons who regularly reside in the center or in the adjacent or nearby redevelopment areas within the economic development district, except:

(1) To the extent that qualified persons regularly residing in the designated area or economic development district are not available;

(2) For the reasonable needs of any such contractor or subcontractor, to employ supervisory or specially experienced individuals necessary to assure an efficient execution of the contract;

(3) For the obligation of any such contractor or subcontractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that in no event shall the number of non-resident persons employed under this subparagraph (3) exceed twenty percent of the total number of employees employed by such contractor and his subcontractors on such project;

b. Every such contractor and subcontractor shall furnish the United States Employment Service Office in the area in which public works or development facility project is located with a list of all positions for which it may from time to time require laborers, mechanics, and other employees, the estimated numbers of employees required in each classification, and the estimated dates on which such employees will be required;

c. The contractor shall give full consideration to all qualified job applicants referred by the local employment service, but is not required to employ any job applicants referred whom the contractor does not consider qualified to perform the classification of work required;

d. The payrolls maintained by the contractor shall contain the following information: The employee's full name, address and social security number and a notation indicating whether the employee does, or does not, normally reside in the area in which the project is located or, in the case of an economic development center, in such center or in an adjacent or nearby redevelopment area within the economic development district;

e. The contractor shall include the provisions of this condition in every subcontract for work which is, or reasonably may be, done as on-site work.

60. "ANTI-KICKBACK" PROVISIONS

a. These provisions of this section, 29 CFR Part 3, prescribe "Anti-Kickback" regulations under section 2 of the Act of June 13, 1964, as amended (40 U.S.C. 276c), popularly known as the Copeland Act.

b. Each contractor or subcontractor shall furnish each week a statement in the following form:

1. Weekly Statement of Compliance

____________________, 19 ___

I, ______________________ ______________________, do
(Name of signatory party (Title)

hereby state:

(a) That I pay or supervise the payment of the persons employed by ______________________ on the ______________________;
(Contractor or Subcontractor) (Building or Work)

that during the payroll period commencing on the ________ day of ______________, 19 ___, and ending on the ________ day of ______________, 19 ___, all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said ______________________ from the full weekly
(Contractor or subcontractor)

wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3, (29 CFR, Part 3), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948; 63 Stat. 108; 72 Stat. 967; 76 Stat. 537; 40 U.S.C. 276c), and described below:

(Paragraph describing deductions, if any)

(b) That any payroll otherwise required under this contract be submitted for the above period is correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(c) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(Signature and Title)

Section 1001 of Title 18 of the United States Code (Criminal Code and Criminal Procedure) shall apply to such statement as provided in 72 Stat. 967 (18 U.S.C. 1001, among other things, provides that whoever knowingly and willfully makes or uses a fraudulent document or statement of entry, in any matter within the jurisdiction of any department or agency of the United States, shall be fined not more than $10,000 or imprisoned not more than five years, or both).

The requirements of this section shall not apply to any contract of $2,000 or less.

Upon a written finding by the head of a Federal agency, the Secretary of Labor may provide reasonable limitations, variations, tolerances, and exemptions from the requirements of this section subject to such conditions as the Secretary of Labor may specify.

2. Permissible Payroll Deductions

Deductions made under the circumstances or in the situations described in the paragraphs of this section may be made without application to and approval of the Secretary of Labor:

(a) Any deduction made in compliance with the requirements of Federal, State, or Local law such as Federal or State withholding income taxes and Federal social security taxes.

(b) Any deduction of sums previously paid to the employee as a bona fide prepayment of wages when such prepayment is made without discount or interest. A "bona fide prepayment of wages" is considered to have been made only when cash or its equivalent has been advanced to the person employed in such manner as to give him complete freedom of disposition of the advanced funds.

(c) Any deduction of amounts required by court process to be paid to another unless the deduction is in favor of the contractor, subcontractor, or any affilitated person, or when collusion or collaboration exists.

(d) Any deduction constituting a contribution on behalf of the person employed to funds established by the employer or representative of employees, or both, for the purpose of providing either from principal or income, or both, medical or hospital care, pensions or annuities or retirement, death benefits, compensation for injuries, illness, accidents, sickness, or disability, or for insurance to provide any of the foregoing, or unemployment benefits, vacation pay, savings accounts, or similar payments for the benefit of employees, their families and dependents: Provided, however, that the following standards are met: (1) The deduction is not otherwise prohibited by law; (2) it is either: (i) voluntarily consented to by the employee in writing and in advance of the period in which the work is to be done and such consent is not a condition either for the obtaining of or for the continuation of employment, or (ii) provided for in a bona fide collective bargaining agreement between the contractor or subcontractor and representatives of its employees; (3) no profit or other benefit is otherwise obtained, directly or indirectly, by the contractor or subcontractor or any affiliated person in the form of commission, dividend, or otherwise; and (4) the deductions shall serve the convenience and interest of the employee.

(e) Any deduction contributing toward the purchase of United States Defense Stamps and Bonds when voluntarily authorized by the employee.

(f) Any deduction requested by the employee to enable him to repay loans to or to purchase shares in credit unions organized and operated in accordance with Federal and State credit union statutes.

(g) Any deduction voluntarily authorized by the employee for making of contributions to governmental or quasi-governmental agencies.

(h) Any deduction voluntarily authorized by the employee for making of contributions to Community Chests, United Givers Funds, and similar charitable organizations.

(i) Any deductions to pay regular union initiation fees and membership dues, not including fines or special assessments: Provided, However, that a collective bargaining agreement between the contractor or subcontractor and representatives of its employees provided for such deductions and the deductions are not otherwise prohibited by law.

(j) Any deduction not more than for the "reasonable cost" of board, lodging, or other facilities meeting the requirements of section 3(m) of the Fair Labor Standards Act of 1938, as amended, and Part 531 of this title. When such a deduction is made the additional records required under S516.25(a) of this title shall be kept.

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ADDENDUM NO. 1 TO GENERAL CONDITIONS OF AUGUST 25, 1967

Section 53 (c) of the General Conditions is revised to read as follows:

53. (c) (1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment of recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notice to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

Section 53 (c) is also revised by the addition of new paragraph (8) as follows:

53. (c) (8) Notice to Prospective Federally Assisted Construction Contractors

(a) A Certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32 F.R. 7439, May 19, 1967) on elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of federally assisted construction contracts exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause.

(b) Contractors receiving federally assisted construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause:

Notice To Prospective Subcontractors Of Requirement For Certifications of Nonsegregated Facilities

(a) A Certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause.

(b) Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause.

SUPPLEMENTAL GENERAL CONDITIONS

1. Enumeration of Plans, Specifications and Addenda
2. Stated Allowances
3. Special Hazards
4. Public Liability and Property Damage Insurance
5. Schedule of Minimum Hourly Wage Rates
6. Builder's Risk Insurance
7. Supplement to GC-14
8. Acceptance and Final Payment
9. Contract Security

1. Enumeration of Plans, Specifications and Addenda:

Division One:

Plans - Sheets One through Thirteen

Division Two:

Plans - Sheets One through Twenty-seven

Divisions One and Two:

Specifications and Contract Documents

ADDENDA:

No. 1 Date June 2, 1969 No. ______ Date ______

No. 2 Date June 5, 1969 No. ______ Date ______

2. Stated Allowances: Pursuant to Paragraph 36 of the General Conditions there are no cash allowances under this contract.

3. Special Hazards: The Contractor's and his Subcontractor's Public Liability and Property Damage Insurance shall provide protection against the following special hazards:

4. Contractor's and Subcontractor's Public Liability, Vehicle Liability, and Property Damage Insurance: As required under Paragraph 28 of the General Conditions, the Contractor's Public Liability Insurance and Vehicle Liability Insurance shall be in an amount not less than $200,000 for injuries, including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than $500,000 on account of one accident, and Contractor's Property Damage Insurance in an amount not less than $100,000 per accident and $200,000 aggregate.

The Contractor shall either (1) require each of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage of the type and in the same amounts as specified in the preceding paragraph, or (2) insure the activities of his subcontractors in his own policy.

5. Schedule of Occupational Classifications and Minimum Hourly Wage Rates as Required under Paragraph 45 of the General Conditions is attached. See Para. 9.

6. Builder's Risk Insurance: As provided in the General Conditions, Section 28(e), the Contractor will maintain Builder's Risk Insurance (fire and extended coverage) on a 100 per cent completed value basis on the insurable portions of the project for the benefit of the Owner, the Contractor, and all subcontractors, as their interests may appear.

7. Supplement to Paragraph 14 "Inspection of the General Conditions": The representatives of the Water Pollution Control Administration of the United States Department of Interior, of the U. S. Department of Labor, and of the Georgia Department of Public Health shall have access to the work wherever it is, in preparation or progress and the Contractor shall provide proper

facilities for such access and inspection.

8. Acceptance of Work and Final Payment: Before final acceptance of the work and payment to the Contractor of the percentage retained by the Owner, the following requirements shall be complied with:

(a) Final Inspection: Upon notice from the Contractor that his work is completed, the Engineer will make a final inspection of the work, and shall notify the Contractor of all instances where his work fails to comply with the Contract Drawings and Specifications, as well as any defects he may discover. The Contractor shall immediately make such alterations as are necessary to make the work comply with the Contract Drawings and Specifications, and to the satisfaction of the Engineer.

(b) Operating Test: After the alterations for compliance with the Contract Drawings and Specifications have been made, and before acceptance of the whole or any part of the work, it shall be subjected to test to determine that it is in accordance with the Contract Drawings and Specifications. The Contractor shall maintain all work in first-class condition for a thirty (30) day operating period after the work has been completed as a whole, the final inspection has been made and the Engineer has notified the Contractor in writing that the work has been finished to his satisfaction. Necessary power, chemicals and materials required for operation will be furnished by the Owner during the specified operation period. The retained percentage as provided herein will not become due or payable to the Contractor until after the thirty (30) days operating period has expired.

(c) Cleaning Up: Before the work is considered as complete, all rubbish and unused material due to or connected with the construction must be removed and the premises left in a condition satisfactory to the Owner. Streets, curbs, cross-walks, pavements, sidewalks, fence and other public and private property disturbed or damaged shall be restored to their former condition. Final acceptance will be withheld until such work is finished.

(d) Liens: Final acceptance of the work will not be granted and the retained percentage will not be due or payable until the Contractor has furnished the Owner proper and satisfactory evidence under oath that all claims for labor and material employed or used in the construction of the work under this contract have been settled, and that no legal claims can be filed against the Owner for such labor or material.

(e) Final Estimate: Upon completion of all cleaning up, alterations and repairs required by the final inspection or operating test, the satisfactory completion of the Operating Test, and upon submitting proper and satisfactory evidence to the Owner that all claims have been settled, the Engineer will issue a certificate of final acceptance of the work. The Contractor shall then prepare his final estimate. After review and approval of the final estimate by the Engineer and the Owner.

9. Contract Security: The Contractor shall furnish a surety performance bond (form attached) in an amount at least equal to 100 per cent of the contract price as security for the faithful performance of this contract, and to

indemnify the Owner against liability for personal injury and property damage. The Contractor shall also furnish a payment bond (form attached) in an amount at least equal to 100 per cent of the contract as security for the payment of all persons performing labor and furnishing materials in connection with this contract. The provisions of Paragraph 29 of the General Conditions which require a 50% paymend bond do not apply to this Contract.

The Surety on each of the above bonds shall be a surety company satisfactory to the Owner duly authorized to do business in Clarke County, Athens, Georgia. The person executing the bond on behalf of the surety shall file with the bond a general power of attorney unlimited as to amount and type of bond covered by such power of attorney, and certified to by an official of said surety. The bond shall be countersigned by an agent who is a resident of Clarke County, Athens, Georgia.

A surety bond for roofing shall be furnished to the Owner, as stated in Section No. 7, before final payment is made under this contract.

9. Wage Determination: A wage determination by the U. S. Department of Commerce is included in these Specifications. Building superstructures only are included under "Building Construction" rates.

SGC-5

WEEKLY STATEMENT OF COMPLIANCE

"I, ______________________________, __________________, do hereby state
(Name of Signatory Party) (Title)

(1) That I pay or supervise the payment of the persons employed

by ______________________________ on the ______________________________;
(Contractor or Subcontractor) (Building or Work)

that during the payroll period commencing on the ____ day of ________________,

19___, and ending on the ____ day of ____________________, 19___, all persons

employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf

of said ______________________________ from the full weekly wages
(Contractor or Subcontractor)

earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 CFR Part 3), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Stat. 108, 72 Stat. 967, 76 Stat. 537; 40 U.S.C. 267c), and described below:

____

____

____

(2) That all payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classification set forth therein for each laborer or mechanic conforms with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the (Bureau of Apprenticeship and Training), United States Department of Labor, or if no such recognized agency exists in a State are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

______________________________ ______________________________
(Signature) (Title)

Note: This statement or equivalent must be on or attached to each weekly payroll. (Statement may be reproduced as needed.) Certifications on sample payrolls are sufficient.

R04-1078-64

SGC-6

NOTICE TO LABOR UNIONS OR OTHER ORGANIZATIONS OF WORKERS

NON-DISCRIMINATION IN EMPLOYMENT

To: ____
(Name of union or organization of workers)

The undersigned currently holds contract (s) with

____
(Name of applicant)

involving funds or credit of the U. S. Government or (a) subcontract (s) with a prime contractor holding such contract (s).

You are advised that under the provisions of the above contract (s) or subcontract (s) and in accordance with Executive Order 10925, Section 301, dated March 6, 1961, and Executive Order 11114 dated June 22, 1963, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, color, creed, or national origin. This obligation not to discriminate in employment includes, but is not limited to, the following:

> HIRING, PLACEMENT, UPGRADING, TRANSFER, OR DEMOTION, RECRUITMENT, ADVERTISING, OR SOLICITATION FOR EMPLOYMENT TRAINING DURING EMPLOYMENT, RATES OF PAY OR OTHER FORMS OF COMPENSATION, SELECTION FOR TRAINING INCLUDING APPRENTICESHIP, LAYOFF OR TERMINATION.

This notice is furnished you pursuant to the provisions of the above contract (s) or subcontract (s) and Executive Orders 10925 and 11114.

Copies of this notice will be posted by the undersigned in conspicuous places available to employees or applicants for employment.

____

____

____

/s/ ___________________________
(Contractor or subcontractor)

____
(Date)

LABOR STANDARDS
Contract Provisions

(1) *Minimum wages.* (i) All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amounts due at time of payment computed at wage rates not less than those contained in the wage determination decision of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics; and the wage determination decision shall be posted by the contractor at the site of the work in a prominent place where it can be easily seen by the workers, For the purpose of this clause, contributions made or costs reasonably anticipated under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of (1)(iv) hereof. Also for the purpose of this clause, regular contributions made or costs incurred for more than a weekly period under plans, funds, or programs, but covering the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

(ii) The contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract, shall be classified or reclassified comformably to the wage determination, and a report of the action taken shall be sent by the Federal agency to the Secretary of Labor. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question accompanied by the recommendation of the contracting officer shall be referred to the Secretary of Labor for final determination.

(iii) The contracting officer shall require whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly wage rate and the contractor is obligated to pay a cash equivalent of such a fringe benefit, an hourly cash equivalent thereof to be established. In the event the interested parties cannot agree upon a cash equivalent of the fringe benefit, the question, accompanied by the recommendation of the contracting officer, shall be referred to the Secretary of Labor for determination.

(iv) If the contractor does not make payments to a trustee or other third person, he may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing benefits under a plan or program of a type expressly listed in the wage determination decision of the Secretary of Labor which is a part of this contract: *Provided, however,* The Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) *Withholding.*

The Federal Water Pollution Control Administration may withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics employed by the contractor or any subcontractor on the work, the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic employed or working on the site of the work all or part of the wages required by the contract, the Federal Water Pollution Control Administration may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) *Payrolls and basic records.* (i) Payrolls and basic records relating thereto will be maintained during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records will contain the name and address of each such employee, his correct classification, rates of pay (including rates of contributions or costs anticipated of the types described in section 1 (b) (2) of the Davis—Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found (as provided for by (1) (iv) hereof) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1 (b) (2) (B) of the Davis—Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(ii) The contractor will submit weekly a copy of all payrolls to the applicant, sponsor, or owner, as the case may be. The copy shall be accompanied by a statement signed by the employer or his agent indicating that the payrolls are correct and complete, that the wage rates contained therein are not less than those determined by the Secretary of Labor and that the classifications set forth for each laborer or mechanic comform with the work he performed. A submission of a "Weekly Statement of Compliance" which is required under this contract and the Copeland regulations of the Secretary of Labor (29 CFR, Part 3) and the filing with the initial payroll or any subsequent payroll of a copy of any findings by the Secretary of Labor pursuant to (1) (iv) hereof shall satisfy this requirement. The prime contractor shall be responsible for the submission of copies of payrolls of all subcontractors. The contractor will make the records required under the labor standards clauses of the contract available for inspection by authorized representatives of the Federal Water Pollution Control Administration and the Department of Labor, and will permit such representatives to interview employees during working hours on the job.

(4) *Apprentices.* Apprentices will be permitted to work as such only when they are registered, individually, under a bona fide apprenticeship program registered with a State apprenticeship agency which is recognized by the Bureau of Apprenticeship and Training, United States Department of Labor; or, if no such recognized agency exists in a State, under a program registered with the Bureau of Apprenticeship and Training, United States Department of Labor. The allowable ratio of apprentices to journeymen in any craft classification shall not be greater than the ratio permitted to the contractor as to his entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered as above, shall be paid the wage rate determined by the Secretary of Labor for the classification of work he actually performed. The contractor or subcontractor will be required to furnish to the contracting officer written evidence of the registration of his program and apprentices as well as of the appropriate ratios and wage rates, for the area of construction prior to using any apprentices on the contract work.

(5) *Compliance with Copeland Regulations (29 CFR Part 3).* The contractor shall comply with the Copeland Regulations (29 CFR Part 3) of the Secretary of Labor which are herein incorporated by reference.

(6) *Subcontracts.* The contractor will insert in any subcontracts clauses (1) through (5) and (7) hereof and such other clauses as the Federal Water Pollution Control Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts which they may enter into, together with a clause requiring this insertion in any further subcontracts that may in turn be made.

(7) *Contract termination; debarment.* A breach of clauses (1) through (6) may be grounds for termination of the contract, and for debarment as provided in Regulations of the Secretary of Labor at 29 CFR 5.6.

(8) *Overtime requirements.* No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any laborer or mechanic in any workweek in which he is employed on such work to work in excess of eight hours in any calendar day or in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all hours worked in excess of eight hours in any calendar day or in excess of forty hours in such workweek, as the case may be.

(9) *Violation; liability for unpaid wages; liquidated damages.* In the event of any violation of the clause set forth in paragraph (8), the contractor and any subcontractor responsible therefor shall be liable to any affected employee for his unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such district or such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of the clause set forth in paragraph (8), in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of eight hours or in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (8).

(10) *Withholding for unpaid wages and liquidated damages.* The Federal Water Pollution Control Administration may withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor, such sums as may administratively be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (9).

(11) *Subcontracts.* The contractor shall insert in any subcontracts the clauses set forth in paragraphs (8), (9), and (10) hereof and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts which they may enter into, together with a clause requiring this insertion in any further subcontracts that may in turn be made.

NONDISCRIMINATION PROVISIONS TO BE INCLUDED IN FEDERALLY ASSISTED CONSTRUCTION CONTRACTS

"During the performance of this contract, the contractor agrees as follows:

"(1) The contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

"(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

"(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

"(4) The contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

"(5) The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

"(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies involved as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

"(7) The contractor will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: *Provided, however,* That in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States."

GPO 923-311

SOL-123
(7-64)

U.S. DEPARTMENT OF LABOR
OFFICE OF THE SECRETARY
WASHINGTON

DECISION OF THE SECRETARY

This case is before the Department of Labor pursuant to a request for a wage predetermination as required by law applicable to the work described.

A study has been made of wage conditions in the locality and based on information available to the Department of Labor the wage rates and fringe payments listed are hereby determined by the Secretary of Labor as prevailing for the described classes of labor in accordance with applicable law.

This wage determination decision and any modifications thereof during the period prior to the stated expiration date shall be made a part of every contract for performance of the described work as provided by applicable law and regulations of the Secretary of Labor, and the wage rates and fringe payments contained in this decision, including modifications, shall be the minimums to be paid under any such contract by contractors and subcontractors on the work.

The contracting officer shall require that any class of laborers and mechanics which is not listed in the wage determination and which is to be employed under the contract, shall be classified or reclassified conformably to the wage determination, and a report of the action taken shall be sent by the Federal agency to the Secretary of Labor. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question accompanied by the recommendation of the contracting officer shall be referred to the Secretary for determination.

Before using apprentices on the job the contractor shall present to the contracting officer written evidence of registration of such employees in a program of a State apprenticeship and training agency approved and recognized by the U.S. Bureau of Apprenticeship and Training. In the absence of such a State agency, the contractor shall submit evidence of approval and registration by the U.S. Bureau of Apprenticeship and Training.

The contractor shall submit to the contracting officer written evidence of the established apprentice-journeyman ratios and wage rates in the project area, which will be the basis for establishing such ratios and rates for the project under the applicable contract provisions.

Fringe payments include medical and hospital care, compensation for injuries or illness resulting from occupational activity, unemployment benefits, life insurance, disability and sickness insurance, accident insurance (all designated as health and welfare), pensions, vacation and holiday pay, apprenticeship or other similar programs and other bona fide fringe benefits.

By direction of the Secretary of Labor,

Acting Solicitor of Labor

DEPARTMENT, AGENCY, OR BUREAU
U. S. Department of Commerce

LOCATION OF PROJECT (CITY OR OTHER DESCRIPTION)
Athens Project No. 04-1-00400

STATE
Georgia

COUNTY
Clark

DECISION NO.
AI-12,626

DATE OF DECISION
3-28-69

EXPIRES
7-25-69

SUPERSEDES DECISION NO.

DESCRIPTION OF WORK:
New Raw Water intake structure and pumps, additional filter basins and clearwell storage, extensions to distribution system including service pumps.

BUILDING CONSTRUCTION	Basic Hourly Rates	H & W	Pensions	Vacation	App. Tr.	Others
Asbestos workers						
Boilermakers						
Boilermaker's helpers						
Bricklayers	$4.75					
Carpenters	3.50					
Cement masons	3.50					
Electricians	3.00					
Glaziers	2.62					
Ironworkers, structural and ornamental	3.60					
Ironworkers, reinforcing	3.60					
Laborers:						
Laborers	1.75					
Air tool op. (jackhammer, vibrator)						
Mason tenders						
Mortar mixers						
Pipelayers (concrete & clay)						
Plasterers' tenders						
Lathers						
Marble & tile setters, terrazzo workers						
Marble, tile & terrazzo helpers						
Painters brush	2.78					
Painters, structural steel						
Painters, spray	3.00					
Piledrivermen						
Plasterers						
Plumbers	4.10					
Roofers	2.75					
Sheet metal workers	3.46					
Soft floor layers	3.50					
Steamfitters	4.10					
Welders—Rate for craft						
Truck drivers	2.00					
Power equipment operators						

BASIC HOURLY RATES

Air compressors		Hoists		Rollers	
Bulldozers	3.00	Backhoes	2.35	Fork lift	2.375
Cranes, derricks, draglines	3.62	Mixers		Scrapers	
Distributors		Loaders	2.75	Shovels	
Finishing machines		Oilers		Tractors	2.875
Firemen		Piledrivers			
Graders		Pumps		Trenching machines	2.625

GA. Zone 2 - a

HEAVY CONSTRUCTION

	BASIC HOURLY RATES	H & W	PENSIONS	VACATION	APP. TR.	OTHERS
Carpenters	$2.50					
Cement Masons	2.50					
Ironworkers, structural	2.50					
Ironworkers, reinforcing	1.60					
Laborers:						
Air tool operator (jackhammer, vibrator)	1.60					
Asphalt spreaders	2.11					
Asphalt rakers	2.11					
Fine graders	2.00					
Landscape workers	1.75					
Pipelayers (concrete, clay and drainage)	1.75					
Powdermen, blasters	1.90					
Unskilled	1.60					
Power Equipment Operators:						
Air compressors	1.60					
Asphalt distributors - spreaders	2.06					
Asphalt plant	2.50					
Backhoes	2.00					
Bulldozers	2.00					
Bull floats	1.75					
Cranes, derricks, draglines	2.47					
Drilling machines	1.75					
Loaders (all types)	2.00					
Mechanics	2.00					
Motor patrols	2.40					
Oilers - greasers	1.91					
Rollers	1.92					
Shovels	2.47					
Scrapers	2.40					
Tractors:						
Crawler	2.00					
Farm	1.60					
Truck Drivers:						
Up to and including 2-½ tons	1.60					
Over 2-½ tons	1.60					

DETAILED SPECIFICATIONS

SECTION NO. 1

GENERAL REQUIREMENTS

ALL DIVISIONS

1.01 Scope: This section of Specifications consists of the General Requirements applicable to all Divisions of the work.

1.02 Definitions: Where the following words or pronouns used in their stead occur herein, and in other sections, they shall have the following meaning:

"Owner" shall mean The City of Athens, Georgia, party of the first part to the following agreement, or its authorized and legal representatives.

"Engineer" shall mean Wiedeman and Singleton, Engineers of Atlanta, Georgia, acting for the Owner, or their duly authorized representative.

"Contractor" shall mean the party of the second part to the following agreement, or the legal authorized representatives of such party.

1.03 Pre-Construction Conference: Prior to commencing work under any Division a pre-construction conference will be held at the office of the Owner, at which time the order and schedule for completion of the work will be presented by the Contractor. The items needed for the completion of the schedule are as follows:

(a) Schedule for submission and approval of working drawings.

(b) Firm delivery schedule for materials and equipment to be incorporated in the work.

(c) Complete schedule of work and monthly partial payments anticipated by the Contractor.

(d) Estimate forms.

The Engineer will advise the Contractor of inspection procedures and requirements for testing. The pre-construction conference must be attended by a representative of EDA.

1.04 Limits: The limits of each Division of work are shown on the drawings.

1.05 Cooperation Between Contractors: Each Contractor is reminded that it is his responsibility to the Owner to cooperate with the other contractors involved in this work. No contractor shall layout his work so as to restrict the access of another contractor. Storage areas at the sites will be allocated to each division of work by the Owner.

1.06 Work and Materials by the Owner: The Owner will furnish all water for testing and construction operations at the nearest existing hydrant to the work or at his option may provide a tap for the Contractor. The Contractor shall furnish all hoses, tanks and other means for conveying water from the hydrant.

or tap of the Owner. The Owner will furnish chemicals and supervise the sterilization process. The Contractor shall furnish the necessary labor for sterilization. The Owner's forces will operate all existing valves required to be operated and will supervise all taps and connections to existing lines made by the Contractor's forces. Existing piping, hose, conduit, etc., noted on the drawings to be removed by the Contractor for Division One may be re-used in the new work, where applicable and practical, at the Contractor's option. Any and all such materials and equipment removed but not re-used shall be turned over to Owner for his stock. No materials will be furnished or work done by the Owner.

1.07 Maintenance of Water Supply: All work involving the temporary or permanent removal of existing facilities from service shall be in accordance with a schedule approved by the Owner. The Contractor shall notify the Owner and obtain his permission in advance of beginning any such work. Under no circumstances shall the Contractor undertake any procedure which will hazard the water supply of the Owner.

1.08 Order and Schedule of Work: The Contractor shall prepare a written construction schedule for the approval of the Engineer prior to beginning construction. The Contractor shall take into consideration the following requirements in the preparation of his construction schedule.

(a) Division One: Work on division two shall be scheduled in order to place portions of the pipeline in service as needed by the Owner at an early date.

(b) Division Two: The first order of work is construction of the Bogart booster station. The first order of plant work is construction of the new filter influent header and replacement of filter media.

After construction of the influent header the filter gallery piping modifications will proceed. The filter influent piping will be removed and the new wash water line and effluent header constructed. Each filter will be connected to the wash and effluent lines in turn so that no more than one filter is out of service at a time.

When filter modifications are complete the settling basin may be taken out of service for modification. Modifications to the flash mixer are also required prior to renewal from service.

Construction of the new settling basin shall begin no later than January 1 and no earlier than November 1. All construction must be complete and the basin returned to service prior to May 15. If this schedule cannot be met in the first year of the contract, construction shall be delayed until the second year.

The construction of the Clearwell, High Service Pumping Station and connecting piping must be complete and placed in service prior to construction of the connections to the existing clearwells.

1.09 Working Drawings: The Contractor shall submit for the Engineer's approval six (6) sets of detailed working drawings for materials and equipment as follows:

(a) Prefabricated concrete form layouts.

(b) Reinforcing steel layouts and bar lists.

(c) Structural steel and bar joist layouts and details.

(d) Miscellaneous metal layouts and details.

(e) Stone work layouts and details including samples.

(f) Brick and tile samples and test reports.

(g) Precast roof slab layouts and details.

(h) Piping layouts and details.

(i) Mechanical, pneumatic, hydraulic and electrical equipment details, diagrams, and instructions, including completely dimensioned anchor bolt, hydraulic, pneumatic, and electrical connection drawings.

(j) Door, window and hardware details.

(k) Any other detail to be used in the work which the Engineer may require.

(l) Door, window, and hardware details.

The Contractor shall check all working drawings submitted by the various suppliers and manufactures for compliance with the plans and specifications and stamp his approval prior to submitting them to the Engineer for his approval. The approval of the Engineer of the Contractor's working drawings shall in no way relieve the Contractor of his responsibility for their accuracy.

Only working drawings approved by the Contractor and Engineer will be permitted on the job. No materials, equipment, or other work shall be laid out or installed using working drawings not bearing the approval of both the Contractor and the Engineer.

Materials and equipment fabricated and delivered to the job without the approval of the Contractor and the Engineer will be subject to rejection and removal either from stock or in place in the work.

1.10 Manufacturers' Service: The Contractor shall engage the service of the technical representative of the manufacturers' of equipment for instruction in installation of the equipment as he may require. The Contractor shall engage these services for approval of installation, testing, placing in operation, and instructing the Owner's personnel in operation and maintenance as follows:

Equipment	Time Required - Days
Each Type Pump (High Service and Raw Water)	2
Instruments (Meters, Rate Controllers, Water Quality, etc.)	3
Chemical Feeders	1
Chlorination Equipment	3
Automatic Pump Discharge Valves Each Type	1

The above is the minimum time required, if additional time is required; due to improper or incomplete installation, faulty equipment, or breakdowns during the operating or one year guarantee period attributable to any of the foregoing; the Contractor shall provide for it at no extra cost to the Owner.

1.11 Cleaning Up: Before the work is to be considered complete, all material not used and/or rubbish of every character must be removed from the site of the work and disposed of by the Contractor. The construction area and the area around such area shall be left in essentially as good condition as existed before the work was done.

1.12 Payment: No separate payment will be made for work under this section of Specifications. The cost of such work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.

SECTION NO. 2

CONTROL OF MATERIALS

ALL DIVISIONS

2.01 Source of Supply and Quality of Materials: The source of supply for all materials and equipment shall be submitted to the Engineer for approval before orders are placed. Tests of all materials being furnished will be required, all as specified herein. Representative preliminary samples of the character and quantity prescribed shall be submitted by the Contractor or producer for examination and tested in accordance with the methods referred to under samples and tests.

Only materials conforming to the requirement of the Specifications and approved by the Engineer shall be used in the work. All materials proposed to be used may be inspected or tested at any time during their preparation and use. If, after trial, it is found that sources of supply which have been approved do not furnish a uniform product, of if the product from any source proved unacceptable at any time, the Contractor shall furnish material from other approved sources. No material, which after approval has in any way become unfit for use, shall be used in the work.

2.02 Samples and the Testing of Materials: Unless otherwise provided for, standard tests of materials will be made in accordance with the Specifications and tests of the American Society for Testing Materials, by a commercial testing laboratory approved by the Engineer, and reports of such test will promptly be furnished to the Engineers. Tests will be arranged by the Contractor unless otherwise directed by the Engineers. The cost of all tests will be paid for by the Contractor.

2.03 Schedule of Materials and Standard Tests: The following schedule of materials and the standard tests to which each is to be subjected are given for the Contractor's guidance.

CEMENT:

(a) Less than carload lots - The brand of a mill in successful operation for at least one year.

(b) 1 car to 5 cars - Certificate of mill test to be furnished by producers of laboratory tests made as per A.S.T.M. Designation C150-55 or Fed. Spec. SS-C-158.

SAND: For use in Cement Concrete:

(a) 10 tons to 100 tons - Field tests only:

(1) Color for organic matter
(2) Decantation test for silt
(3) Sieve analysis

(b) For each additional 100 tons - Independent Laboratory tests to indicate conformity with A.S.T.M. Designation C33-55T, as amended to date of Fed. Spec. SS-A281A.

STONE AND GRAVEL: For use in Cement Concrete: (Coarse aggregate)

(a) 10 tons - 200 tons - Similar to Sand (a)

(b) Each additional 200 tons Similar to Sand (b)

CONCRETE:

Preliminary Tests	-	Job Tests
Cylinder Compression tests of concrete made of cement and aggregate proposed to be used in the work; in accordance with A.S.T.M. Designation C39-44.		Cylinder Compression Tests of Concrete placed in the work, from samples taken at two different times during any major pour of Structural concrete; in accordance with A.S.T.M. Designation C39-49.

Preliminary tests shall include at least two cylinders; one to be broken at 7 days and one at 28 days.

Job tests shall include at least four cylinders for each test; two to be properly stored at the site; and two for laboratory tests, one to be broken at 7 days and one at 28 days.

BRICK (Building):

(a) 1 to 5 Thousand - Visual inspection for shape, color, soundness, freedom from cracks, balls of clay or particles of lime.

(b) For each additional 50 Thousand or part thereof - Absorption test and either compression or flexure tests, A.S.T.M. Designation C67-50 by an independent laboratory.

CONCRETE MASONRY UNITS:

(a) 1 to 5 Thousand - Visual inspection for shape and color, soundness, freedom from stains, cracks or other defects.

(b) For each additional 5 Thousand or part thereof - Same as (a); also, tests for absorption and compression as per A.S.T.M. Designation C90-52, Grade B units.

CAST IRON PIPE AND SPECIAL CASTINGS:

(a) Any quantity - Certified tests furnished by foundry, field tests for dimensions, coating and holes; hammer test.

STRUCTURAL STEEL:

(a) Any quantity - Field inspection for rust, shape and dimensions.

(b) 25 to 200 Tons - Independent shop inspection and certified copies of mill tests.

(c) For Bridges and Buildings - See A.S.T.M. Designation A7-55T.

CONCRETE REINFORCEMENT STEEL:

(a) Up to 50 Thousand Lbs. - Field inspection for rust, shape and dimensions.

(b) 50 Thousand Lbs. and Up - Independent laboratory inspection as follows:

  (1) Billet Steel - A.S.T.M. Designation A15-54T.

  (2) Rail Steel - A.S.T.M. Designation A16-54T.

  (3) Cold-drawn Steel Wire - A.S.T.M. Designation A82-34.

  (4) Wire Fabric - A.S.T.M. Designation A185-54T.

CLAY SEWER AND DRAINAGE PIPE AND FITTINGS:

(a) Any Quantity Field Inspection: For shape, cracks, blisters, absence of vitrification, hammer test, laboratory stamp.

CAST IRON PIPE AND FITTINGS:

(a) Any Quantity Field Inspection: For dimensions, coating, cement lining, holes, hammer tests, weights.

Laboratory Tests: Certified test reports.

CONCRETE DRAIN LINES: Non-Reinforced

(a) Any Quantity Field Inspection: For shape, cracks, uniformity density, imperfect surfaces, hammer test, permeability test, damaged ends, laboratory stamp.

2.04 Payment: No separate payment will be made for work under this section of Specifications. The cost of such work and all costs incidental thereto shall be included in the price bid for the items to which such work pertains.

SECTION NO. 3

SITE PREPARATION, EXCAVATING, BACKFILLING, FOUNDATIONS, GRADING AND GRASSING

3.01 Scope: The work covered by this section of Specifications consists of furnishing all materials and equipment and performing all labor necessary for clearing, excavating, backfilling and grading required for general grading and site development and grassing and to permit construction of the structures, and buildings; in strict conformity with the accompanying plans, the Specifications and the directions of the Engineers.

3.02 Site Conditions: The Contractor's attention is directed to paragraphs of Instructions to Bidders and Special Provisions relating to Site Examination.

3.03 Clearing Site: The area of actual construction shall be cleared of trees, stumps, roots, brush, rubbish and other such materials to limits shown on the drawings. Trees and shrubs designated to be left in place, and those outside of limits, shall not be damaged. All waste materials resulting from clearing operations shall be burned or otherwise disposed of in a satisfactory manner. Materials to be burned shall be neatly piled, and when in a suitable condition shall be completely burned and then removed from the site.

Shrubbery in front of the filter building shall be removed by a suitable nursery and then replanted and healed in after pipeline construction. Grass in front of the filter building shall be resoded.

3.04 Stripping: The Contractor shall strip the entire area within cut, fill and graded areas to remove all top soil, vegetable matter, and other objectionable materials. Top soil and vegetable matter shall be carefully stockpiled and preserved for surfacing of all graded areas and fill slopes. The base of all embankments and fills shall be scarified and rolled so that the base will be well bonded with the first layers of fill.

3.05 Grading: Upon completion of construction operations the area shall be finish graded to be in accordance with finish contour elevations and grades shown on the drawings. Graded areas shall be made to blend into conformation with remaining ground surfaces. All surfaces shall be left smooth and free to drain. The tops of all cuts shall have berm ditches.

(a) Additional Material: If additional material, other than that to be obtained from excavation, is required for backfilling and grading, the Contractor shall obtain such additional material from borrow, on or near the site, as directed by the Engineer.

(b) Excess Material: Any excess earth excavation, and all rock excavation shall be placed on or near the site as directed by the Engineer. Surfaces and slopes of waste fills shall be left smooth and free to drain.

Excavated rock shall not be mixed with material selected for tamped backfilling under and around pipe lines up to a level at least two feet above the pipe. No rocks, stones or boulders larger than 60 pounds shall be allowed to be mixed with backfill material from two (2') feet above the top of pipe lines or structures foundations to within one foot of finished grade. Excavated rock shall not be mixed with backfill material used to

complete the final 12-inch layer of backfill. Surplus rock shall be removed and wasted at points as directed by the Engineer. Waste rock fills shall be graded uniformly and covered with a minimum of 6" of earth fill dressed smooth and free to drain.

3.06 Excavations: The Contractor shall perform all excavating of every description, and of whatever substances encountered, to the dimensions and levels shown on the drawings, and/or specified. Excavation may be accomplished by any customary method.

(a) Rock: Rock will be classified for additional payment. The bidder shall satisfy himself as to rock and other materials which may be encountered in excavation, and make proper allowances for all contingencies in his lump sum bid. Any information indicated on the drawings, or otherwise furnished, with reference to drillings made on the plant site are offered as information only. Neither the Owner, nor the Engineer, will be responsible for subsurface conditions found to be otherwise.

Solic rock shall consist of such materials in the original bed or well defined ledges which in the opinion of the Engineer cannot be removed with pick and shovel, ditching machine, back-hoe, or other similar devices, and which requires drilling and blasting, or the use of jack hammers or bullpoints. Boulders or detached pieces of rock having volumes of more than 8 cubic feet shall also be considered as rock.

Ledge rock, boulders and large stones shall be removed to provide a clearance of not less than 6 inches in any horizontal direction from all parts of piping, fittings, and other appurtenances.

Where rock excavation is encountered at grade in trenches for piping, the trench shall be excavated not less than 4 inches below the bottom of the pipe bell, refilled with gravel or crushed stone, thoroughly tamped in place, and shaped to the pipe as specified elsewhere. No payment in addition to price paid for rock excavation or lump sum work will be made for gravel or stone bedding above specified.

The Engineer must be given ample notice to measure all rock after it has been stripped and before it is blasted. No payment will be made for any rock blasted before such measurement is made.

(1) Structures: The limits for payment of rock excavation for structures shall be as follows: No more than two (2') feet outside of wall line or to neat outside line of footing slab if footing slab extends more than two (2') feet outside of wall line.

Excavation for footings shall be to the neat outside dimensions for widths and length and no deeper than the bottom of the footing slab, unless undercutting and backfilling to sub-grade is ordered by the Engineer. Excavation for structures in solid rock will be paid for at the unit price of eight ($8.00) dollars per cubic yard as stated in the Proposal.

(2) Trenches: The limits for payment of rock excavation for pipe trenches shall be as follows: For a width equal to the outside diameter of the pipe bell plus 12 inches, the sides of the trench

being considered vertical, and to a depth of 4 inches below the bell of the pipe laid on the grade established by the Engineer. Excavation for trenches in solid rock will be paid for at the unit price of twelve ($12.00) dollars per cubic yard as stated in the Proposal.

(b) Footings: Footings shall be excavated to the depth indicated on the drawings. Footings shall rest on firm undisturbed earth assuring proper bearings.

Where called for on the plans or at the direction of the Engineer, excacation for footings may be extended in depth in the event earth does not have required bearing value. The resulting excess excavation shall then be filled with compacted crushed stone to bring such excavated area to the levels required to receive slabs.

(c) Method: Excavation may be accomplished by any customary method, If blasting is found to be necessary, the Engineer shall be advised before any expolsive is brought on the job and he shall prescribe such precautionary measures as he deems necessary.

(d) Limits: Excavate for a sufficient distance from foundation walls to allow for inspection and to permit the various trades to install their work. Trenches for foundation walls shall be a minimum of two feet wider than the thickness of the walls. Excavation for piers shall be at least two (2') feet greater than the dimensions of the footings. Excavation for footings shall be to the footing dimensions.

(e) Depth: Care shall be taken that excavation does not extend below the exact lines of the footings and floor slabs on ground. Should the excavation, through carelessness or negligence on the part of the Contractor be carried below such lines, the Contractor shall fill in the resulting excess excavation with concrete under walls and footings and with concrete or crushed stone, as directed, under slabs. This work shall be done at the Contractor's expense. Concrete for this purpose shall be of the same quality and mix as that for footings.

(f) Slabs on Earth: Where slabs on earth occur, all loam, organic, or other undesirable material shall be removed as required by the Engineer. When filling is required to bring such excavated area to the levels required to receive slabs, the fill shall be compacted by tamping and rolling to obtain 95% of maximum density. Layers shall be not more than six (6") inches thick.

(g) Blasting for Footings: Due to the nature of the rock foundation of the structures blasting will be done using small charges so that underlying strata will not be damaged.

3.07 Blasting: All blasting operations shall be conducted in accordance with existing ordinances and regulations, and shall be done subject to the Engineer's approval of the method and quantity of explosive to be used. Exposed structures shall be protected from the effects of blasts and blasts shall be covered with suitable mats, and shall be restricted to the extent that no appreciable shock will be transmitted to structures, pipe lines, sewers or other facilities under construction. All blasting supplies shall be stored in a manner approved by the Engineer and a watchman shall be stationed at all times at the place of storage.

3.08 Water and Uplift: The Contractor shall by the use of well points, pumps, or other approved methods, prevent the accumulation of water in excavated areas. Should water accumulate it shall be promptly removed. The Contractor shall also provide for dewatering areas adjacent to uncompleted structures to prevent uplift during construction operations. The Contractor will be held responsible for any damage due to uplift of new structures during construction operations.

3.09 Yard Fills and Backfilling Around Structures: All yard fills and backfills around structures shall be of selected materials properly placed in layers. The layers shall be thoroughly compacted to at least 95% of maximum density, each layer to be not deeper than six (6") inches compacted thickness. Compaction of yard fills shall be by use of heavy sheeps foot roller and until the roller "walks-out". Compaction around structures shall be by use of heavy power tamping equipment. Selected materials shall also be used for backfill around pipe in pipe trenches.

3.10 Finish Grading: Finish grading shall be performed in accordance with the finished elevations and grades shown on the drawings and shall be made to blend into conformation with remaining natural ground surfaces. All finished grading surfaces shall be left smooth and free to drain. Selected materials, which have been obtained from stripping the site, shall be spread upon all graded areas to be grassed to a uniform depth and compacted suitably for planting. Excess materials shall be spread and compacted as directed.

Grading within the construction area and around the outside of building or structure lines shall be performed in such a manner as to prevent accululation of water within the area. Where necessary or where shown on the drawings, finish grading shall be extended to insure that water will be carried to drainage ditches, and the site area left smooth and free from depressions holding water.

3.11 Roadways, Yards and Driveways: Roadways, yards and driveways shall be graded to widths, gradients and limits shown on the plans. The fills shall be thoroughly compacted to form a suitable sub-base for compacted stone base. The Contractor shall place all sub-fills to be approximately eight (8") inches lower than the finished elevations shown on the plans. Roadway shoulders, and areas outside the surfacing areas shall be graded to the elevations shown on the drawings.

3.12 Unauthorized Excavation: Footings or slabs shall rest on undisturbed earth or rock to insure proper bearing, therefore care shall be taken that excavation does not extend below bottom levels of footings or slabs on earth or rock. Should the excavation, through carelessness or neglect, be carried below such levels, the Contractor shall fill in the resulting excess excavation with concrete under footings, and with crushed stone, gravel, or other approved material under slabs. Should excavation be carried beyond outside lines of footings such excess excavation shall be filled with concrete, or form work shall be provided, as directed by the Engineer. Additional costs of corrective work, made necessary by authorized excavation of earth or rock, shall be borne by the Contractor.

3.13 Grassing shall be as follows:

A. Bermuda seed and live sprigs.

B. Domestic (Italian) rye seed, if ordered by Owner.

Grassing with Bermuda shall be done only if it can be completed between May 15 and August 15. Grassing after the above 3-month period and before October 15 shall be done with domestic rye at the Owner's option. The work of grassing shall include all finished grade areas, including cut and fill slopes, within the fenced area.

Bermuda sprigs shall be live, fresh and selected with roots uninjured from sources native to the locality of the work as approved by the Engineer. Sprigs shall be planted in furrows ten inches apart, the furrows to run parallel to contours of the same approximate elevation, sprigs to be eight inches apart in the furrow.

Before planting, a fertilizer of 4:12:4 or other approved composition shall be hand raked into the top soil at a rate of 25 pounds per 1,000 square feet and then watered. All sprigs shall be placed within an hour after removal from the location in which they are growing. Ground shall be damp or freshly watered before planting. Sprigs shall be rolled after planting. Hulled Bermuda Seed shall be tamped in on all areas planted with sprigs at the rate of 3 pounds of seed per 1,000 square feet of surface area.

All planting and seeding shall be watered thoroughly as soon as completed and shall be watered at least twice daily, or oftener if necessary to provide continuous growth without setback until all growth from seed is thoroughly established.

Domestic (Italian) rye seed, if used, shall be raked in at a rate of 10 pounds per 100 square feet. Fertilizer and watering shall be the same as for Bermuda.

3.14 Limits of Grassing: The areas to be grassed shall include all finished grade areas. All cut and fill slopes shall be grassed.

3.15 Payment: No separate payment will be made for work under this specification, except as may be specifically set forth in the Proposal. The cost of such work and all cost incidental thereto, except such work as may be specifically set forth in the Proposal, shall be included in the price bid for the item to which the work pertains.

SECTION NO. 4

CONCRETE WORK

4.01 Scope: The work covered by this section of Specifications consists of furnishing all materials and equipment and performing all labor necessary for the complete construction of all concrete work, including all work and appurtenances thereto, as indicated on the drawings and/or specified to be required for completion of all work under this contract.

4.02 General: Work under this section of specifications shall include the installation of all sleeves, inserts, piping, hangers, anchors, frames or other such items to be built into the concrete work, and all other such work and appurtenances specified and/or required for proper execution of the work. All such items shall be correctly positioned in form work and shall be inspected and approved prior to placing of concrete.

4.03 Concrete; Composition, Classification and Strength: Concrete shall be composed of cement, fine aggregate, coarse aggregate and water, proportioned and mixed to produce a plastic workable mix in accordance with the requirements of this Specification and suitable for the specific conditions of placement.

(a) Classification and Strength: Concrete used in the work shall be in three classifications. Classifications of concrete, minimum 28-day compressive strength and usage shall be as follows:

(1) Class "A": Minimum compressive strength 3000 psi shall be used for all reinforced concrete work, and for un-reinforced footings and slabs 8-inches or less in thickness.

(2) Class "B": Minimum compressive strength 2200 psi shall be used for gravity types walls and for un-reinforced footings and slabs over 8-inches in thickness.

(3) Class "C": Minimum compressive strength 1500 psi shall be used for concrete sub-foundations, pipe envelopes and for concrete backfill when required.

Compressive strength of concrete at the age of 28 days shall be determined by breaking standard 6-inch diameter by 12-inch test cylinders in accordance with A.S.T.M. C31-55 and C39-49, as amended to date.

4.04 Concrete - High-Early Strength: Concrete made with high-early strength Portland cement shall be used only when specified or when specifically authorized by the Engineer. The compressive strength of such concrete, at the age of 7 days, shall be at least equal to the minimum 28 day compressive strengths specified above. All other provisions of these Specifications shall be applicable to such concrete.

4.05 Materials: Materials for use in concrete work, including Admixtures, Aggregates, Cements, Form Material and Water shall be in accordance with the following:

(a) Admixtures: "Pozzolith" as manufactured by the Master Builders Co. shall be added to all Class "A" concrete in accordance with the manufacturer's directions. A standard Master Builders dispenser for the introduction of "Pozzolith" to the mix and the services of a representative of the manufacturer to install the dispenser and set up the operation thereof shall be furnished by the Contractor. No admixture is required for Class "B" or Class "C" concrete.

(b) Aggregate - Fine: Fine aggregate shall be natural sand consisting of hard, strong, durable and uncoated particles, and shall conform to the requirements of Federal Specifications SS-A-281a Class 1, Grade A, or A.S.T.M. C-33-55, as amended to date, with gradation as follows:

Total Passing	Per Cent by Weight
No. 4 Sieve	95 - 100
No. 16 Sieve	45 - 95
No. 50 Sieve	10 - 30
No. 100 Sieve	2 - 10

Fine aggregate shall have a fineness modulus of not less than 2.30 nor more than 3.00. Variation in fineness modulus shall be limited to ± 0.20 from the average of all tests.

(c) Aggregate - Coarse: Coarse aggregate shall be washed gravel or crushed stone consisting of hard, strong, durable and uncoated particles, and containing no vegetable matter, nor soft, friable, thin or elongated particles in quantities considered deleterious by the Engineer. Coarse aggregate shall conform to the requirements of Federal Specifications SS-A-281a Class 2, Grade A, or A.S.T.M. C-33-55, as amended to date, with gradation as follows:

Retained On	Per Cent by Weight
1-1/2" Sieve	0
1" Sieve	0 to 15
1/2" Sieve	45 to 70
No. 4 Sieve	95 to 100
No. 16 Sieve	99 to 100

(d) Cement: The cement content of concrete for Class "A" concrete shall consist of 75% Portland cement and 25% blast furnace slag cement measured by volume or may be Portland blast furnace slag cement conforming to A.S.T.M. Specifications C205-53. The cement content of Class "B" and Class "C" concrete shall consist of Portland cement. Cement shall be furnished in accordance with the following:

1. Portland Cement shall conform to A.S.T.M. Specifications C-150-55, as amended to date.

2. High-Early Portland Cement shall conform to A.S.T.M. Specifications C-150-55, Type III, as amended to date.

3. Portland Blast-Furnace Slag Cement shall conform to A.S.T.M. Specifications C205-53T, as amended to date.

4. Slag Cement shall conform to A.S.T.M. C358-55T, as amended to date.

(e) Form Material: Form materials, including lumber, lining and form ties shall be in accordance with the following:

(1) Class of Material: Forms shall be of plywood, and shall be of grade or type suitable to obtain the kind of finish required. Form lining, where used, shall be of tempered fiber board of not less than 1/8 inch thickness. Metal forms or other types of manufactured forms shall not be used unless specifically authorized by the Engineers.

(2) Form Oil: Form oil shall be non-staining mineral oil.

(3) Form Ties: Form ties shall be of the cone nut threaded rod, or standard snaptie type with wooden cones, designed so that when removed no metal will be left closer than 1-inch from the finished wall face. All form ties shall be furnished with water stops unless otherwise permitted by the Engineer. The cavities left in faces of concrete work by removal of form ties shall be pointed up with non-shrink mortar. Form ties shall have a minimum working strength of at least 3,000 lbs. when fully assembled and shall be as approved by the Engineer. The use of form ties with plastic cones will not be permitted.

4.06 Storage: Cement and aggregate stored on the site shall be stored in the following manner:

(a) Cement: Cement shall be stored immediately upon receipt at the site of the work, in a thoroughly dry, weather-tight, properly ventilated building with adequate provisions for prevention of the absorption of moisture. Storage shall be such as to permit ease of access for inspection, and to permit definite identification of each shipment of cement.

(b) Aggregate: Fine and coarse aggregate shall be stored separately, and in such a manner so as to avoid the inclusion of any foreign material in concrete. Stockpiles of coarse aggregate shall be built in horizontal layers to avoid segregation.

4.07 Testing: Testing of materials shall be done by an independent commercial testing laboratory approved by the Engineers. Such tests shall be arranged for by the Contractor and paid for by the Owner. Reports of such tests shall be promptly submitted to the Engineer. Sampling and testing of aggregates, cement and concrete cylinders shall be as specified under the section "Control of Materials" of these specifications, and in accordance with the following:

(a) Sampling and Testing Aggregates: Sampling and testing of aggregates shall be in accordance with the section "Control of Materials" of these specifications. The Contractor shall select the source of the concrete aggregates which he proposes to use in the work, and shall furnish suitable samples of such aggregates to the testing laboratory, at least thirty (30) days in advance of the time of proposed use for testing and preparation of design mix.

(b) Testing Cement: The sampling and testing of cement shall be in accordance with the section "Control of Materials" of these specifications. Cement which has been stored for more than four months after being tested shall be re-tested before use.

(c) Testing Concrete: Concrete cylinders for testing purposes shall be made in accordance with the procedure set forth in A.S.T.M. C31-55, entitled "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field", as amended to date. Compression tests of concrete cylinders shall be made at the age of 7 days and 28 days by the testing laboratory in accordance with procedures set forth in A.S.T.M. C39-49 entitled "Standard Methods of Tests for Compressive Strength of Molded Concrete Cylinders", as amended to date, and as required by the Engineer. After beginning work the number of tests shall be as set forth in the following table, but shall be not less than one for each type of concrete for any pour.

Total Cu. Yds. Concrete Placed	Minimum Number Tests
0 to 100	One each pour
100 to 1,000	One each 250 Cu. Yds.
1,000 to 2,000	One each 350 Cu. Yds.
2,000 and over	One each 500 Cu. Yds.

Each test shall consist of at least 4 specimens. Two shall be for field control and two for laboratory control.

(d) Slump Tests: Slump tests of concrete shall be made in the field by the Contractor for each pour with an accurately made sheet iron test cone, in accordance with the provisions of A.S.T.M. Specification C143-52, entitled "Standard Method of Slump Test for Consistency of Portland Cement Concrete". The slump for concrete to be placed in piers and walls shall be not less than 4 inches nor greater than 7 inches. The slump for concrete to be placed in slabs on earth or rock shall be not less than 1 inch, nor greater than 4 inches.

4.08 Design Mix: A design mix for each classification of concrete to be used in the work shall be prepared and tested by the Independent Commercial Testing Laboratory selected by the Contractor and approved by the Engineer for the testing of materials as specified in the paragraph "Testing" above. The design mix shall be prepared using samples of the cement or blend of cements, the admixture if required, and the aggregates to be used in the work. Cement blend and admixture shall be as specified in paragraph 5.05. A minimum of 4 cylinders shall be made from the design mix for each classification of concrete, 2 to be tested at 7 days and 2 to be tested at 28 days. Cylinders shall be made and tested in accordance with A.S.T.M. C31-55 and C39-49, as amended to date.

4.09 Proportioning: Materials used in concrete shall be proportioned so as to produce a workable mixture, having a slump within the required limits, and with a minimum water content.

(a) Control: The exact proportion of materials to be used in concrete shall be as determined by the Laboratory Design Mix, and as directed by the Engineer. The equipment necessary to positively determine and control actual amounts of materials entering into the concrete shall be furnished

by the Contractor. The proportions of materials used in the mix will be changed whenever, in the opinion of the Engineer, such a change is necessary to obtain the required strength, or the desired density for uniformity and workability. In structures intended to be watertight, good workability will be considered to be of primary importance.

(b) Measurement: All materials shall be measured by weight, except for water, which may be measured by volume. One bag of Portland cement shall be considered to weigh 94 lbs., one gallon of water to weigh 8.33, and one bag of Slag cement to weigh 79 lbs.

(c) Cement Content: Each cubic yard of concrete shall contain as a minimum the following quantities of cement.

Class "A"	-	5-1/2	bags or	516 lbs.
Class "B"	-	5	bags or	470 lbs.
Class "C"	-	4	bags or	376 lbs.

The cement weights above are based on the use of Portland cement; if the use of slag cement is required the quantity of slag cement used shall be 25% by volume of the total cement requirement, and the above weights reduced accordingly.

(d) Water Content: In calculating the total water content of any mix, the amount of water carried on the surface of the aggregate particles shall be included. The total water content per bag of cement, for each batch of concrete shall not exceed 6.0 gallons, unless specifically authorized by the Engineers. The amount of water to be used in the mix shall, in all cases, be the minimum amount necessary to produce a plastic mix, of the required strength, and of the desired density, uniformity, workability, and within the required slump limits.

(e) Aggregate Content: The total volume of aggregates to be used in each cubic yard of concrete, and the proportion of fine aggregate to coarse aggregate shall be that necessary to produce a dense mixture of the required workability, as determined by the Laboratory Design Mix, and as directed by the Engineer.

4.10 Mixing: Concrete to be placed in the work may be proportioned and mixed by the Contractor on the site of the work, or may be proportioned and mixed in a Central Mix Plant, in accordance with the following:

(a) Mixing on Job Site: When concrete is proportioned and mixed on the job site the Contractor shall provide the equipment necessary to positively determine and control the actual amounts of materials entering into the mix. Mixing shall be done in a batch mixer of approved design which will insure a uniform distribution of the material throughout the mass. The entire contents of the drum shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the rated capacity of the machine. The Contractor shall, during the mixing and placing of concrete, have a minimum of two concrete mixers on the site so as to maintain continuity of the pour in the event of mechanical failure of one of the mixers.

(1) Time of Mixing: The mixing of each batch shall continue a

minimum of 1-1/2 minutes after all materials are in the mixer, during which time the mixer shall rotate at a peripheral speed of at least 200 feet per minute.

(b) Mixing at Central Plant: Where concrete is proportioned and mixed at a cental plant, the concrete shall be conveyed to the work in approved mixer trucks, which shall mix the concrete enroute to the work. Plant layout and equipment shall meet the approval of the Engineer, and concrete shall be proportioned, mixed and transported under the following conditions:

(1) Laboratory Representative: The Contractor shall furnish the services of a representative of an approved testing laboratory, who shall be present at the central mix plant whenever Class "A" concrete is proportioned and mixed for the work, and shall control proportioning and mixing operations, except when otherwise approved by the Engineer.

(2) Loading Tickets: Loading tickets shall be initialed by the laboratory representative, and the time of loading stamped thereon. Such tickets shall be handed to the inspector upon arrival of the mixer truck on the job site, before placing the load.

(3) Transporting: Concrete must be transported to the site of the work in approved mixer trucks, which will mix the concrete enroute. In extreme hot weather, when approved by the Engineer, the required amount of water may be added to the mix upon arrival of the truck at the work, in order to avoid pre-set of the mix during the time the mixer truck is enroute.

(4) Specifications: The mixing and handling of ready mixed concrete, except as otherwise specified above shall conform to the requirements of A.S.T.M. Specifications C94-55, as amended to date. In the event the above conditions are not complied with such concrete will be subject to rejection.

4.11 Placing Concrete: Before concrete is placed the depth and character of the foundations, the adequacy of forms and falsework, the placing of steel and appurtenant work shall be inspected and approved by the Engineer; such approval however, shall not relieve the Contractor of the responsibility to produce the finished work. Preparation for placing concrete, and the handling and placing of concrete, shall be in accordance with the following:

(a) Preparation: All accumulated water and debris shall be removed from excavations, or from form work into which concrete is to be placed, and any flow of water into such places shall be diverted into side drains or sumps, so as to be removed without disturbing newly placed concrete. Forms, unless lined, shall be thoroughly wetted with water before concrete is placed so as to tighten joints and prevent leakage from the mix. Runways for buggies or wheelbarrows, if used, shall not be supported on form work. Concrete shall be conveyed in such a manner so as to not disturb forms.

(b) Daylight Placing: All concrete shall be placed in daylight, and the placing of concrete in any portion of the work shall not be begun if such

work cannot be completed during daylight, unless otherwise specifically approved by the Engineer. Such approval will not be given unless an adequate lighting system is provided.

(c) Cold Weather Placing: Concrete shall not be placed when the atmospheric temperature is below 35 degrees Fahrenheit. If after placing concrete the temperature drops below 35 degrees Fahrenheit, the Contractor shall enclose, heat and protect the work in such a manner so as to keep the air surrounding the fresh concrete at a temperature of not less than 45 degrees Fahrenheit for a period of 5 days after concrete is placed. The Contractor shall assume all risk connected with the placement and protection of concrete under the above, and should such concrete be unsatisfactory, it shall be rejected.

(d) Handling: Concrete shall be transported from the mixer to the point of deposit by a bottom dump concrete bucket handled by a crane, by concrete buggies, or by wheelbarrows. In the event the quality of the concrete as it reaches the forms, or the method and placing thereof, in the opinion of the Engineer, are not satisfactory, the Contractor shall change his method of operation so as to place concrete in a satisfactory manner.

(e) Placing: Concrete shall be placed in such a manner so as to avoid the possibility of segregation or separation of aggregates, so as to avoid displacement of reinforcing, and to avoid coating or splattering the reinforcing steel which is in place, with concrete which may set before completion of the pour, and tend to reduce bond. Troughs, pipes, hoppers and chutes and canvas tremies used in placing concrete shall be arranged and used so as to place the concrete in the manner specified. The placing of concrete within form work shall be regulated so that the pressure within form work caused thereby shall not exceed the design pressure thereof. Concrete shall be placed in continuous horizontal layers the thickness of which, in general, shall not exceed 12 inches. In placing concrete each batch and each layer shall be placed following the preceding batch or layer so closely that there will be no lines of separation or "cold joints" in the work. Care shall be used to fill each part of the forms by depositing concrete as near final position as possible. After the concrete has taken its initial set care shall be used to avoid jarring the form work or placing strain or vibration on the ends of projecting reinforcing bars.

(1) Compaction: Concrete, as placed in layers shall be compacted by the use of mechanical internal vibrating equipment, supplemented by hand spading with a steel splicing rod. Vibrating shall not be used to transport concrete within forms. Internal vibrators shall maintain a speed of at least 5000 impulses per minute when submerged in concrete. At least one spare vibrator shall be maintained on the job site as a relief. The duration of vibration shall be limited to that necessary for satisfactory consolidation, without causing objectionable segregation. The vibrator shall not be inserted into lower layers which have begun to set.

(2) Thin Sections: All thin section work shall be thoroughly worked with a steel rod, faces shall be shaped and mortar flushed to the surface of the forms thereby. Small diameter holes shall be drilled in form work beneath large wall sleeves and inserts which have been

set therein, to prevent the entrapment of air beneath such wall sleeves and inserts, when concrete is placed.

(f) Continuous Placement: The placement of concrete within any unit of the work, between construction joints, once begun shall continue without interruption so that the unit will be monolithic in construction.

(g) Defective Work: Concrete shall be placed and compacted so as to form a dense, compact, impervious, artificial stone, with smooth faces on exposed surfaces. Any section of concrete work found to be porous, plastered, or otherwise defective, in the opinion of the Engineer, shall be removed and replaced in whole or in part, as directed by the Engineer, at the expense of the Contractor.

4.12 Construction Joints: The unit of operation between construction joints shall be as shown on the drawings or as directed by the Engineer. Concrete shall be placed continuously within the unit, as specified in the paragraph above, so that the unit will be monolithic in construction. At least 72 hours shall elapse between casting of adjoining units, unless otherwise approved by the Engineer.

(a) Joints in Footing and Walls: Construction joints in footings and walls, required for proper execution of the work, and not shown on the drawings, shall be located, as directed by the Engineer, across regions of low shearing stress so as to least impair the strength and appearance of the work. Special provisions shall be made for joining successive units, as shown on the drawings and as directed by the Engineer.

(b) Joints in Slabs: Construction joints in slabs, required for proper execution of the work, and not shown on the drawings shall be located as directed by the Engineer. Special provisions, including concrete footing for construction joints in slabs on earth, shall be made for joining successive units, as indicated on the drawings and as may be directed by the Engineer.

(c) Expansion Joints: Expansion joints, when required shall be located as indicated on the drawings and constructed in accordance with details thereon.

(d) Keys and Steel Plates: Keys shall be constructed in all construction joints, as indicated on the drawings, and as directed by the Engineer. Both keys and steel plates shall be constructed in construction joints subject to water pressure. Steel plates used in such joints, unless otherwise indicated on the drawings, shall be 6-inch by 10-gauge and of the length of the joint.

4.13 Bonding Concrete Work: Bonding new concrete work, to be placed on or against new concrete work, shall be in accordance with the following:

(a) Bonding to New Concrete: Before placing new concrete work on or against new concrete work which has recently set, the surfaces of such work shall be thoroughly roughened and cleaned of all foreign matter and laitance, forms placed or tightened and the surfaces slushed with grout. New concrete shall be placed before grout has attained its initial set. All such work shall be done in such a manner to insure complete bonding.

(1) Grout: Grout for bonding to new concrete work shall be composed of 1 part Portland cement to 3 parts sand, and from 2 to 4 inches of such grout shall be applied for horizontal construction joints.

4.14 Form Work: Form work shall be constructed and braced and shall be removed in accordance with the following:

(a) Chamfer Strips: Chamfer strips shall be placed in form for all exterior corners.

(b) Constructing and Bracing Forms: Form work shall be built to conform to shape, lines, and dimensions of the concrete work as shown or indicated on the drawings. Forms shall be set to line and grade, and shall be braced, tied and secured so as to withstand placing of the concrete, and to maintain shape and position. Forms shall be tight and substantially assembled to prevent bulging, and to prevent leakage of concrete. Joints in form work shall be arranged vertically or horizontally. Temporary openings shall be arranged, where required, at the bottoms of wall forms and other necessary locations, to facilitate cleaning and inspection. Lumber used once in forms shall have nails removed and surfaces in contact with concrete work thoroughly cleaned before re-use. All wall sleeves, inserts and openings required in concrete work shall be properly set in form work.

(1) Shores: Shores shall be used as necessary. If adequate foundations for shores cannot be obtained, trussed supports shall be provided. Structural members and other work, subjected to additional loads during construction shall be adequately shored to protect such work from distortion and/or damage.

(c) Removal of Forms: Forms shall not be removed, until the member supported thereby has acquired sufficient strength to safely support its own weight and the load imposed on it. Tie rod clamps that are to be entirely removed from walls shall be loosened 24 hours after concrete has been placed. Standard snap ties shall be removed when forms are stripped, with care being taken to avoid spoiling concrete surface. Cutting ties back from the face of the wall will not be permitted. Under normal conditions the minimum time elapsing before the forms may be stripped shall be governed by the following schedule, however, the use of said schedule shall not relieve the Contractor of his responsibility for the safety of the structure.

Slabs	14 Days
Columns and Pedestals	7 Days
Walls and Vertical Faces not supporting other work	2 Days

Wood forms shall be completely removed from all portions of the work so that no material will remain for termite infestation.

4.15 Finished Concrete: All exterior concrete surfaces shall be finished to levels not less than 12 inches below finish grade levels and all interior concrete surfaces within buildings below grade, and other such surfaces exposed to view shall be finished. Interior of filters shall be finished from top to bottom. Interior of basins shall be finished to a level not less than 12 inches below overflow level. Concrete not exposed to view and therefore not specified

to be finished shall have rough edges tooled off and shall be pointed and spot finished to fill irregularities.

(a) Pointing: When concrete has set sufficiently to permit, forms and form ties shall be carefully removed. All depressions resulting from removal of form ties, and all other holes and rough places shall be thoroughly wetted with water and pointed with non-shrink sand-cement mortar.

(b) Rubbing: After pointed surfaces have set sufficiently to permit, all surfaces specified to be finished shall be kept wetted with water, and rubbed with a carborundum stone of medium fineness, or other equally as good abrasive, to bring the surface to a smooth texture and to remove all form and other marks. The paste formed by the rubbing may be rubbed down by floating with a canvas, a carpet-faced, or a cork float, or may be rubbed down with dry burlap. Plastering will not be permitted.

4.16 Concrete Floor Surfaces and Slabs: Before constructing concrete slabs on earth, all piping under such slabs shall have received the required tests. The sub-grade shall provide a solid bearing, and shall be brought to a true and even plane. Where drains occur, floors shall be pitched thereto, as indicated on the drawings. The Concrete to be placed shall be of a comparatively dry consistency and shall be screeded level or to the proper grade. After compacting or vibrating, the surface shall be prepared to receive the type of finish specified.

(a) Wood Float Finish: All exterior floors, walks, platforms, stairs, and other floor or slabwork shall have a wood float finish. After screeding to the required grade while the concrete is still green, but has hardened sufficiently to bear the finisher's weight, the surface shall be floated with a wood float to a true and even plane, with no coarse aggregate visible and sufficiently rough to prevent slipping. New interior floors to have a steel trowel finish with floor hardener, or shall be screeded to the required sub-grade to receive terrazzo or quarry tile surfacing.

(b) Floor Surfaces: A floor hardening material to provide a working surface shall be applied to all new interior concrete floors. The floor hardening material shall be Masterplate neutral color and as manufactured by Master Builders Company applied in strict accordance with the manufacturer's recommendations. Floor hardener shall be applied at the rate of 0.5 pounds per square foot. After all work is completed and plant is in operation a seamless-resilient surfacing shall be applied TORGINOL COMMERCIAL color to be selected by Engineer.

4.17 Pre-Cast Concrete Slab Roof Deck: Roof decks, unless otherwise shown on the plans, shall be precast lightweight channel slabs. All slabs shall be composed of an approved brand of portland cement and high grade aggregate, accurately graded and thoroughly mixed and vibrated for maximum density.

Depths shall be 2-3/4" for spans up to 6'-4" and 3-1/2" or greater for longer spans. Each leg shall be reinforced with a deformed bar accurately centered. Web thickness shall be one full inch, reinforced with galvanized wire mesh, accurately centered. All slabs shall be designed for a safe uniform load of 65 pounds per square foot and ultimate load of 250 pounds per square foot. All channel slabs shall have adequate bearing and joints shall be filled with an approved mastic in accordance with manufacturer's recommended practice.

4.18 Mass Concrete Sub-Foundations and Compacted Stone Base: Mass concrete sub-foundations and compacted stone base shall be provided beneath structural footings and slabs, if required, as directed by the Engineer, and as follows:

(a) Concrete Sub-Foundations: Concrete sub-foundations shall be of mass concrete of the widths and depths required, and shall be placed as directed by the Engineer. Concrete shall be Class "C" as specified.

(b) Compacted Stone Base: Compacted stone base shall be provided for structural slab work, when required, as directed by the Engineer. Base material shall consist of crusher run stone or slag, size 1-1/2 inches down, and shall be compacted by the use of heavy rolling or power tamping equipment to provide a safe bearing value of at least three thousand lbs. per square foot as may be determined by bearing tests.

4.19 Curing and Protection: Concrete freshly placed shall be protected from wash by rain and flowing water. Concrete shall not be allowed to dry out from the time it is placed until the expiration of the specified curing period. Methods of curing, unless otherwise approved by the Engineer, shall be as follows:

(a) Wetting Concrete: Concrete shall be kept wet with clean water for a period of 7 days after placing. Each day forms are left in place will suffice for wetting.

(b) Leaving Forms in Place: Curing may be accomplished by leaving forms in place for a period of 7 days, and keeping such forms sufficiently wet to prevent opening of joints.

(c) Membrane Curing: In lieu of curing methods specified the Contractor, at his option, may use an approved membrane curing compound to seal water in concrete, except for surfaces which are to receive future concrete or mortar. The membrane shall be of non-staining type which will retain 97% of the moisture within concrete at a temperature of 135° F., with a relative humidity of 30% in the first 24 hours. Curing compound shall be applied in accordance with the manufacturer's directions.

4.20 Watertightness: Concrete required to be watertight shall be proportioned mixed and placed in strict accordance with these specifications. All concrete structures for holding or carrying water, or pits below ground level, shall be watertight and a loss of more than 1/4 inch depth in 24 hours will not be permitted when water holding structures are filled. All exposed surfaces of water holding structures, and interiors of pits below ground water level shall be free from visible damp spots or seepages before acceptance.

4.21 Imperfect or Damaged Work: Imperfect or damaged work, or any work damaged before final acceptance shall be satisfactorily removed and replaced in accordance with the requirements of the drawings and specifications. Removal and replacement of concrete work shall be done in such a manner that the strength of the structure will not be impaired.

4.22 Cleaning: Upon completion of work all forms, equipment, protective covering, and rubbish resulting therefrom shall be removed from the premises. Finished concrete surfaces shall be left in a condition satisfactory to the Engineer.

4.23 Payment: No separate payment will be made for work under this specification, except as may be specifically set forth in the Proposal. The cost of such work and all cost incidental thereto, except such work as may be specifically set forth in the Proposal, shall be included in the price bid for the item to which the work pertains.

SECTION NO. 5

REINFORCING STEEL, STRUCTURAL STEEL AND MISCELLANEOUS METAL

5.01 Scope: The work covered by this section of specifications consists of furnishing all materials and equipment and performing all labor necessary for furnishing and installing all reinforcing steel, structural steel and appurtenances as indicated on the drawings, as specified; and as required for completion of all work under this contract.

5.02 Drawings: The Contractor shall furnish to the Engineer for checking and approval six copies of bending and placing details for steel bar reinforcing which shall show bar size, spacing, bending and tagging identification, and six copies of drawings covering structural steel work showing details of fabrication and erection of structural steel for checking and approval. No manufacture or fabrication shall commence until such drawings have been approved.

5.03 Reinforcing Steel: Bar reinforcement, wire mesh and expanded metal reinforcement shall be furnished by domestic steel mills and placed in accordance with the following:

(a) Bar Reinforcement: Materials, fabrication, and placement of steel bar reinforcement shall be in accordance with the following:

(1) Materials: Steel bar reinforcement shall conform to the requirements of A.S.T.M. Standard Specifications for "Billet Steel Concrete Reinforcement," Designation A-15-54T, as amended to date, or for "Rail Steel Concrete Reinforcement", Designation A-16-54T, as amended to date, subject to the following restrictions:

Billet Steel: Billet steel shall be of intermediate grade steel made by the open hearth process or by electric furnace.

Rail Steel: Rail steel bars shall be rolled from standard tee section rails.

Cold Twisted Bars: The use of cold twisted bars will not be permitted.

Test Specimens: Test specimens shall be a minimum of 48 inches.

Deformed Bars: Steel bar reinforcement shall be of an approved deformed type, such that a mechanical bond will be provided between concrete and steel at frequent intervals. Deformation shall be in accordance with A.S.T.M. Specification A305-53T.

(2) Fabrication: Steel bar reinforcement shall be cold bent to shapes indicated on the drawings. Bending shall be done in the shop before shipment unless otherwise specified. Bending details for steel bar reinforcement shall conform to the requirements of the ACI Building Code (ACI318-56) unless otherwise indicated on the drawings or specified. Steel bar reinforcement shall be bent,

bundled, and tagged in accordance with details furnished by the fabricator.

a. Splices: Steel bar reinforcement shall be furnished full length unless otherwise indicated on the drawings or approved by the Engineer. Splices where permitted, shall be well distributed or located at points of low tensile stress. Splices and dowels, except when used in cantilever wall or slab construction shall lap not less than 30 times the diameter of the bar. Splices and dowels used in cantilever wall or slab construction shall lap 40 diameters. Splices in horizontal reinforcement shall be staggered. The minimum clear distance between spliced bars, except when bar clamps are specified, shall be 1-1/2 bar diameters, but in no case less than 1 inch, nor less than 1-1/2 times the maximum size of coarse aggregate.

b. Hooks: Hooks of 180° shall have a radius of bend on the axis of the bar of not less than three bar diameters plus an extension of four bar diameters at the free end. Hooks of 90° shall have a radius of bend on the axis of the bar of not less than four bar diameters plus an extension of twelve bar diameters at the free end.

c. Openings: Openings 12 inches and larger through concrete walls and slabs shall have a minimum of 4 extra diagonal bars in each face of the wall or slab of the same size as the largest bar in the wall or slab. The length of extra diagonal bars at openings shall be a minimum of 80 bar diameters.

d. Minimum Reinforcing: Concrete walls, slabs and other concrete work shown on the drawings to have no reinforcing, shall have a minimum area of steel bar reinforcing equal to 0.003 times the cross sectional area of the concrete work.

(3) Placing: Steel bar reinforcement shall be placed in the locations shown on the drawings and held securely in place during the placing of concrete. The pushing of short bars into new concrete work will not be permitted. Bar reinforcing in walls shall be spaced the proper distance from the face of the wall by the use of approved pre-cast concrete mortar blocks. Bar reinforcing in slabs or beams shall be spaced the proper distance from the bottom of the slab or beams by use of approved pre-cast concrete mortar blocks or steel chairs. Vertical stirrups shall always pass around main tension members and be securely attached thereto. Bar spacing, covering, minimum clearance, bond and anchorage shall conform to the requirements of the ACI Building Code (ACI318-56), as amended to date, except as otherwise indicated on the drawings or specified.

(4) Fastening, Reinforcing and Placing Concrete: Steel bar reinforcing, when properly placed, shall be securely wired together at intersections with 18 gauge black annealed wire. Prior to the placing of concrete all mortar and other foreign matter which may reduce or destroy bond shall be removed from the reinforcement. No concrete shall be deposited until the placement of the reinforcing has been approved by the Engineer.

(b) Wire Mesh Reinforcement: Wire mesh reinforcement, when shown on the drawings or specified to be required in the work to be done, shall be furnished and placed in accordance with the following:

(1) Materials: Wire mesh reinforcement shall conform to the requirements of A.S.T.M. Standard Specification A-185-54T, as amended to date, and unless otherwise indicated on the drawings, shall be 4-inch by 4-inch mesh, of 6 gauge wire.

(2) Placement: Wire mesh reinforcement shall be secured in position by spacer bars and chairs. Spacer bars shall be lapped not less than 5 inches. Pre-cast concrete mortar blocks may be used in lieu of metal chairs in slabs on ground. Mesh shall be checked for position during placing of concrete and any displacement corrected. Mesh shall overlap 1 inch at edges unless otherwise indicated on the drawings, and shall be securely tied at ends and overlap.

(c) Expanded Metal Reinforcement: Expanded metal reinforcement, when shown on the drawings or specified to be required in the work to be done, shall be of a type approved by the Engineer, of metal equal in quality to that specified for bar reinforcement; and when placed shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and additions.

(d) Reinforcement - Storage and Protection: Steel reinforcement shall be stored above the surface of the ground upon platforms, skids or other supports, and shall be protected as far as is practicable from mechanical injury and surface deterioration. When placed in the work it shall be free from rust, dirt, scale, paint, oil, or other foreign matter which may reduce or destroy bond.

5.04 Structural Steel:

(a) Design: Design of structural steel members is based on ASTM A7 steel. Other grades of steel specified in the latest AISC specification may be used with the approval of the Engineer, provided the structure has the same capacity and same deflection. Fabrication and erection shall be in accordance with AISC requirements.

(b) Connections: Connections shall be shop welded and field high strength bolted. Connection design shall be based on the full strength of the member for uniform loading. Composition beams shall be considered to have cover plates on top and bottom of equal size to those actually fabricated for the bottom flange. Tubular sections shall be all welded where exposed.

(c) Welding: All welding shall be performed in accordance with Code 1, Part A of the "Code for Fusion Welding and Gas Cutting in Building Construction" as revised to date by the Committee in Building Codes of the American Welding Society. In assembling and during welding, the component parts of built up members shall be supported and held by sufficient clamps and other adequate means to hold the parts in proper relation for welding.

(d) High Strength Bolting: High strength bolts shall be in accordance with ASTM A 325-61T. Installation shall be in accordance with "Specifications for Structural Joints using ASTM-A325 Bolts" published in

October, 1962 by the ASCE Structural Division and as follows:

(1) Calibrated wrenches shall be used to provide the specified bolt tension and shall induce a torque 5% to 10% in excess of this value. When several bolts are used in a joint, the wrench shall be returned to "touch up" bolts previously tightened.

(2) The Contractor shall demonstrate to the satisfaction of the Engineers that bolts are tightened properly by reapplying torque tools as necessary.

5.05 Miscellaneous Iron and Steel Work: Miscellaneous steel and iron work shall be as follows:

(a) Structural Steel: Structural steel shall be furnished in accordance with the requirements of A.S.T.M. Standard Specifications "Structural Steel for Buildings", as amended to date. Fabrication and erection shall be in accordance with A.I.S.C. requirements. Painting shall be in accordance with the section "Painting" of these specifications.

(b) Steel Joists: Steel joists where indicated on the drawings to be required for construction of the work shall be furnished and erected as indicated on the drawings and in accordance with the standard specifications of the Steel Joists Institute. Shop and field painting of steel joists exposed to view shall be as specified for structural steel.

(c) Wrought Iron shall be reinforced bar iron, tough, fibrous, and uniform in character. It shall be thoroughly welded in rolling and be free from surface defects and shall conform to "Specifications for Refined Wrought Iron Bars," Federal Specification QQ-I-686a.

(d) Bolts and Nuts shall be of the best quality mild steel, or wrought iron, except where bronze nuts are shown on the drawings. They shall have hexagon nuts, but may have square heads. Heads and nuts shall have the under-surfaces true and at right angles to the axis of the bolts. Bolts shall have sound, well fitting, truncated "V" threads, American National coarse-thread standard. When bolts are used in place of rivets, they shall have a driving fit. Bolts and nuts in general shall be of United State Standard dimensions. All anchor bolts embedded in concrete shall be of cadmium-plated mild steel.

(e) Expansion Bolts: Anchor bolts and screws, in general, shall be placed in forms prior to pouring concrete. When expansion bolts must be used they shall be Phillips (Redhead) self drilling type, or approved equal.

(f) Workmanship shall be first class in every respect and shall conform to the latest and best practice as set forth in the latest specifications of the American Institute of Steel Construction. All material shall be thoroughly straightened in the shop by methods that will not injure it before templates are placed on same for laying off and before any work is done upon it. All material shall be kept clean and protected from the weather.

(g) Welding, in general, shall be used for connections in fabricated miscellaneous metal work. All welding shall be performed in accordance

with Code I, Part A, of the "Code for Fusion Welding and Gas Cutting in Building Construction", as revised to date by the Committee in Building Codes of the American Welding Society. In assembling and during welding, the component parts of built-up members shall be supported and held by sufficient clamps and other adequate means to hold the parts in proper relation for welding.

(h) Drawings: Where details are shown on the drawings, the structural steel or wrought iron work shall conform accurately to them. Where the drawings are diagrammatic, the Contractor shall design the connections in accordance with the best shop practice and so as to develop the full strength of the members. The Contractor shall furnish for approval, complete shop drawings showing all framed work and all connections to concrete or other masonry, and shall also furnish all necessary erection drawings.

(i) Shop Painting: Except as otherwise specified, exposed surfaces of steel and iron (except galvanized surfaces) shall be painted in the shop after fabrication as specified under "Painting". Contact for riveting or welding in the field shall be left bare and painted promptly after the field welding or riveting is completed. Steel work for certain other equipment shall not be shop painted, but shall be cleaned by sandblasting and painted on the job as specified under "Painting".

5.06 Iron Castings: The Contractor shall furnish and install all miscellaneous iron castings, including catch basin and manhole frames, covers, steps, floor drains, bolt inserts, brackets, supports and such other iron castings as are shown on the plans.

(a) Castings, unless otherwise specified shall be of gray-iron conforming to Federal Specifications QQ-I-652.

(b) Malleable Castings shall conform to Federal Specifications QQ-I-666.

(c) All castings shall be tough, close-grained, and smooth, and free from blow holes, blisters, shrinkage stains, cracks, cold shots, and like defects. No plugging of defective castings will be permitted.

(d) Workmanship: All castings shall be made accurately to dimensions shown on the plans or ordered and shall be planed or ground where necessary whether marked or not, to secure perfectly flat bearing surfaces. Allowance shall be made in the patterns so that the specified thickness of metal will not be reduced.

(e) Weights: No castings will be accepted, the weight of which is less than the theoretical weight, based on required dimensions, by more than five (5%) per cent.

(f) Cleaning and Painting: All castings shall be thoroughly cleaned and painted before rusting begins. All castings except those to be embedded in concrete, shall be cleaned and given a priming coat of paint in the shop. Castings which will be exposed in buildings shall receive a shop coat of zinc chromate and iron oxide. Castings which are to be installed outdoors, such as manhole frames, covers and steps, shall be given 2 coats of approved bituminous paint in the shop.

5.07 Aluminum: Aluminum work shall be furnished as indicated on the drawings and as specified below.

(a) Subway Grating: All subway grating fabricated from aluminum, shall be of the size and type shown on the drawings. Aluminum bearing angles shall be anchored in concrete to form grating frames. Cuts in grating around piping and other openings, as well as ends of bearing bars shall be banded. Grating layout shall be made from approved piping and valve layout drawings. Suitable anchors shall be provided for all grating supported on structural steel members, and in other locations where shown on the drawings. All grating exposed to weather shall be Aluminum.

(b) Aluminum Gates and frames shall be built of structural or extended shapes as shown on the plans, or specified and shall be given an anodizing finish equal to Alcoa No. 205 Aluminite.

5.08 Steel Grating: Steel grating shall be galvanized, unpainted and shall conform to specifications listed in 5.07(a). Steel grating may be used for all grating not exposed to weather and shall be of type and style shown on the drawings, unless otherwise shown on the drawings. Steel grating I beam supports, grating stops, anchor clips and hardware shall be galvanized after fabrication and remain unpainted.

5.09 Payment: No separate payment will be made for work under this specification, except as may be specifically set forth in the Proposal. The cost of such work and all cost incidental thereto, except such work as may be specifically set forth in the Proposal, shall be included in the price bid for the item to which the work pertains.

SECTION NO. 6

PIPING AND VALVES

6.01 Scope: The work covered by this section of Specifications consists of furnishing and installing piping and valves.

6.02 Interior Pipe and Fittings: Pipe in sizes 2" and under shall be copper, sizes 2-1/2" to 3-1/2" genuine wrought iron, and sizes 4" and over cast iron or ductile iron as specified. Piping for pressures under 50 psi may be either Cast Iron ASA Class 22 or Ductile Iron ASA Class 1 for Interior Building service. Piping for pressures 50 psi and over shall be ASA Class 2 Ductile Iron Pipe. Fittings shall be cast iron similar class. Details of lining, weight, fitting types and marking shall be as indicated. Sleeves shall be installed at all points where piping passes through walls; such sleeves with piping caulked therein shall be watertight. Wall sleeves 24" and smaller shall be standard cast iron through wall sleeves except as shown on the plans. Cast iron sleeves shall be manufactured with water stop integrally cast. Sleeves larger than 24" may be either cast iron or fabricated steel 1/2" minimum thickness with water stop and caulking ring of a design acceptable to the Engineer. Pipe and fittings requiring finish painting shall be shop painted with INERTOL 621. The exterior of sleeves shall be unpainted. All fittings shall be short-body standard unless otherwise shown.

6.03 Heavy Interior Piping Systems: The Contractor shall furnish and install all heavy interior piping systems, complete, all as indicated on the drawings and specified and/or as required for proper operation of equipment to be installed under this contract. Such piping systems shall be joined in accordance with the section "Yard Piping and Valving" of these Specifications.

(a) Hangers, Supports and Blocking: Piping systems shall be properly supported by a system of hangers, pipe stanchions, brackets, concrete piers and saddles as required. Inserts, bolts and anchors as required for proper support shall be set into form work or concrete work by the Contractor before any concrete is poured. Pressure lines shall be secured with struts or reaction blocking to prevent any slippage.

(b) Operating Piping Systems: Operating piping for all small operating systems required for operation of equipment installed under this contract shall be furnished and installed as specified for such work under this section of specifications.

(c) Wall Sleeves: Wall sleeves shall be accurately installed at all points where piping passes through walls. Such sleeves with piping caulked therein shall be watertight.

(d) Valves: Gate valves and manually operated butterfly valves for installation in interior piping systems shall be furnished as specified for such equipment under this section of Specifications.

6.04 Operating Piping Systems: The Contractor shall furnish and install all small operating and control piping systems indicated on the drawings and/or as required for operation of all operating and control equipment specified to be installed under this contract.

The Contractor's attention is called to the small pneumatic and other piping shown on the plans. It is intended that the plans show only the size, number and approximate location of small piping headers connecting the various areas of the plant where instrumentation equipment is located. It is not intended that the plans show the detail requirements as to local connections. Local connections are indicated on the schematic diagrams and will be shown in further detail on the equipment manufacturer's drawings. It is the Contractor's responsibility to make all small piping connections required to assure the complete and satisfactory functioning of the equipment shown on the plans and specified.

(a) Materials: Piping for all operating and control piping systems, including pneumatic supply and control piping systems, shall be of hard drawn copper except where otherwise specified herein. Copper pipe, copper fittings and joints and valves shall be as follows:

(1) Copper Pipe: Pipe sizes specified are nominal internal diameters. All exposed pipe except where otherwise specified, shall be of hard drawn rigid copper pipe. Pipe installed in ducts or within equipment cabinets may be of soft drawn copper. All such soft drawn copper shall be stretched after being uncoiled and before being installed. No piping smaller than 1/4" nominal internal diameter shall be used. Copper pipe 1" and smaller shall be Type L weight and thickness. Pipe 1-1/4" and larger shall be Type M weight and thickness. All changes in direction of such pipe shall be made with solder joint fittings.

(2) Copper Fittings and Joints: Copper fittings shall be of the cast pattern or of the wrought pattern with only one pattern type being used in the installation. The mixing of cast and wrought pattern fittings will not be permitted. Fittings for rigid copper pipe shall be of the silver solder joint type. Fittings for concealed soft drawn pipe may be of the flared mechanical type. Unions shall be of the ground joint type with a union installed at every point of piping connection to a machine, piece of equipment, or fixture which may require disconnecting for service or maintenance. All pipe ends shall be cut square and burred internally and externally before insertion in fitting socket. All pipe ends shall be sanded clean and all fitting sockets shall be wire brush cleaned to insure 100% tinning of the socket and pipe joint surfaces and to insure full solder penetration of the joint. No acid or acid base solder flux shall be used for surface cleaning. The solder bead at the external pipe to socket joint shall be "wiped" while the solder is still molten with a dry cloth. All piping shall be thoroughly blown out and cleaned with high pressure air before connecting to instruments.

(3) Valves: Valves shall be solder end, check, gate or globe pattern as specified or indicated on the drawings. For air, globe and check valves shall have composition disc for tight shut-off. All valves shall be designed for 125 psi working pressure. Valves for gauges where required shall be union gauge cocks with pipe threaded to copper adaptors.

(b) Coatings of Operating and Control Piping Systems: Operating and

control piping systems shall be cleaned, polished, and coated with clear vinyl as specified under the section "Painting" of these Specifications.

(c) Installation and Arrangement: All pipe runs shall be paralleled with or at right angles to walls, ceilings, equipment, etc. 45° fittings or angle runs shall be avoided as far as possible. Piping shall be neatly arranged and installed, such that it both meets the service requirements and leaves the machine or equipment it is serving accessible. Insofar as possible, all valves shall be installed accessible for operation by a man standing on the floor.

(1) Installation on Grade: All piping whose service requires draining of moisture shall be installed with the required slope in the proper direction for gravity drainage.

(2) Parallel Runs: All parallel runs of piping shall be installed with equidistant spaces between the piping and shall be neatly grouped. Grouping shall be such that cross-overs, except at branches, are avoided.

(d) Hangers and Supports: The maximum distance between hangers or supports shall not exceed:

1/4" and 3/8" diameter - 4'
1/2" diameter - 6'
3/4" and 1" diameter - 8'
1-1/4" to 2" diameter - 10'
2-1/2" diameter and larger - 12'

Piping, 1" and smaller, shall not be hung from rod hangers. Rod hangers, where used, for pipe 1-1/4" and larger shall be split pattern. No pipe shall be clamped directly to a masonry or concrete surface. Brackets shall be used such that there will be a space, not less than 3/4", between the pipe and any surface. Piping, 1" and smaller, and preferably piping 1-1/4" and larger, shall be clamped to brackets or other steel members with clamps which will allow no axial movement. Clamps and clamping arrangements shall be of the "Unistrut" type, properly supported from fabricated steel brackets, beams, etc., to provide the required maximum support distance for the diameter of pipe, drainage slope, arrangement, and grouping required.

(e) Hydraulic Operating Pipe: Hydraulic operating pipe shall be of sufficient size for proper operation of equipment, and unless otherwise specified lateral size shall in no case be smaller than equipment connection size. As specified above, unions and valves shall be installed at each point of connection to equipment.

(f) Pneumatic Supply and Control Piping Systems: Piping for pneumatic supply systems, including main supply headers and supply laterals, shall be of the size and in locations indicated on the schematic and control equipment manufacturer's drawings. Headers and laterals or air supply from compressor shall be run on upward and/or downward grades with drip legs and automatic drain traps or separators at all low points. Small supply laterials from main supply headers and laterals to each instrument

or control used shall be 3/8" I.D. copper. Air sets consisting of drip leg, regulator and pressure gauge shall be furnished for each instrument and control user by the manufacturer of such instrument and control user and shall be mounted as close to said user as is possible. Pneumatic control piping shall be 1/4" I.D. copper. Pneumatic control piping, where approved by the Engineer, and where control piping may be grouped, may consist of "Poly-Cor" cable containing the proper number of Poly-ethylene color coded 1/4" O.D. pneumatic control and supply tubes in an extruded 1/16" black vinyl sheath. Such cable, if used, shall be rigidly supported as specified for other pneumatic piping, and shall be "Dekoron", furnished as manufactured by Samuel Moore and Company or approved equal, or installed with Dekoron E-Z fittings and connectors in accordance with the manufacturer's recommendations.

6.05 General Requirements for Valves: The following requirements apply to all types of valves specified in Paragraphs which follow. Valves classified according to use are as follows:

(a) Exterior Valves: Valves for exterior service as shown on the drawings shall be furnished with buried operator suitable for use with valve boxes, and furnished with AWWA operating nut. Butterfly valves shall require extension stems and operators where shown on the drawings.

(b) Filter Valves: Filter valves shall be hydraulic operated with extension stems. Operation will be with electric 4-way valve positioners and limit switch indication. Furnish hydraulic operators for existing filter valves as shown on the plans.

(c) Manual Operated Interior Valves: Interior valves shall be furnished with mechanical operators for sizes 16-inch and larger.

6.06 Butterfly Valves: All butterfly valves furnished under this section of specifications shall be of the tight closing rubber seat type, with rubber seats which are recess mounted into the valve body and shall be furnished as manufactured by the Henry Pratt Company, Leopold, or Builders-Providence, Inc. Wafer type butterfly valves will not be acceptacle. All such valves shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity. Valves shall be suitable for installation with the valve shaft in any position and the clear inside diameter of each such valve shall not be less than the nominal valve size minus one inch. All valves furnished under this section of specifications shall comply with the requirements of AWWA Specification C-504-58 except as otherwise specified herein, and shall be furnished as shown on the drawings and/or as specified. In general all valves shall be butterfly valves except as shown or specified otherwise.

(a) Class: Butterfly valves for low pressure service shall be furnished in accordance with AWWA Specifications Class 25-8, suitable except for sizing operator, for 50 psi shut-off. Butterfly valves for high pressure service shall be Class 125-16 suitable except for sizing operator for 150 psi shut-off.

(b) Valve Construction: Construction of butterfly valves, including valve bodies and flanges, valve discs, shafts, seats and bearings, shall be in accordance with the following requirements:

(1) Valve Bodies and Flanges: Valve bodies shall be constructed of close grain cast iron ASTM A-126 Class B and shall have flanged ends faced and drilled and spot faced on the back side for bolting ASA 125 lb., or shall be for Dresser Coupling to steel pipe, mechanical joint or hub end for bell-spigot leaded joints for cast iron connections as shown on the drawings. Two trunnions for shaft bearings shall be integral with each valve body.

(2) Valve Discs: Valve discs shall be cast of stainless cast iron containing at least 14% nickel, 6% copper and 2-1/2% chromium (Military Specifications MIL-G-858a, Class One).

(3) Valve Shafts: Shafts of all valves shall be turned, ground and polished 18-8 type 304 stainless steel. Each shaft shall extend full size through the valve discs and bearings and shall be securely attached to the valve disc by means of "tangentially" fitted stainless steel taper pins or keys. Stub shaft valves will be considered, the bidder shall offer at least one through shaft valve in the Proposal as well as stub shaft valves.

(4) Valve Seats: Valve seats shall be of Hycar or natural rubber.

(5) Valve Bearings: Butterfly valves shall be fitted with sleeve type bearings contained in the bearing trunnions of the valve body. Bearings shall be self-lubricated and shall be constructed of bronze impregnated with a silicone oil or of nylon. In addition to the shaft bearings, each valve 24" and larger shall be equipped with an adjustable thrust bearing which is totally enclosed and protected and which is set and locked to hold the valve disc and shaft assembly securely in the center of the valve seat. Valves designed for shaft connection to an operator shall be provided with a shaft bearing beyond the stuffing box gland. The housing for this bearing shall be rigidly attached to the valve body or may be fitted into the valve operator assembly which in turn shall be rigidly attached to the valve body.

(c) Valve Operators, Manual Type: All butterfly valves furnished under this section of specifications shall be furnished with manual type valve operators, except as shown on the plans. Valve operators shall be designed to hold the valve disc in any intermediate position between fully open and fully closed without creeping or fluttering, and shall be capable of transmitting sufficient torque to open and close each valve under operating conditions shown on the drawings. All manual operators shall be Pratt Sidewinder or equal for the service indicated.

(1) Extension Operators: Valves shall be equipped with extension operators in all exterior installations and in interior installations where indicated on the drawings or required by Specifications. Valves equipped with extension operators shall be mounted with the valve shaft in a vertical position and shall contain the extension stem within a pipe extension bolted to the valve operator flange. In the case of buried valves, the pipe enclosing the extension stem shall extend above ground level to normal floor stand operator height and shall be equipped with a top flange which shall be bolted to the geared type operator specified above. In the case of valves located

within structures and requiring extensions, the pipe enclosing the extension stem shall extend to the level at which the operator is to be placed and shall be connected to a floor stand mounted operator. Hand wheels for all operators shall be mounted in a vertical plane with horizontal shafts and hand wheels for all exterior valves be equipped with a locking device, and position indicator.

(d) Valve Operators, Water Hydraulic Type: Hydraulic valve operators shall be designed for water use at 50 psi operating pressure. The cylinder shall conform to AWWA Specification C-504-58, 12.5 for maximum pressure of 150 psi. Cylinders shall be as manufactured by Hydro-Line, Hanafin, Miller or approved equal. All hydraulic valves and operators shall be Class 25-8 and shall have a stainless steel chrome plated shaft operating through "O" rings. Filter sweep valves shall be Class 125-16.

(e) Valve Operators for Pump Discharge: Valve operators shall be pneumatic-hydraulic type, furnished with hydraulic speed controls. The valves are to be operated by air pressure from a 40 to 60 psi pneumatic system. The operator shall consist of a pneumatic cylinder connected to an oil dashpot. Movement of the piston shall cause oil to flow through external piping to the other side of the dashpot. Valve speed is to be controlled by throttling the hydraulic line. Closure time for the valve shall be arranged to vary from 20 seconds to one minute. Two valves are required, one for each raw water pump.

(f) Valve Controls: The automatic check valve operators shall be equipped with controls with the following functions:

(1) When the pump start button is pushed the valve remains immobile until pump discharge pressure reaches 25 psi. At that point a pressure switch trips and allows a four-way value solenoid valve, to open, thus operating the butterfly valve.

(2) When the stop button is pushed the valve will close and trip a limit switch to stop the pump.

(3) Upon power failure the pump shall stop and the valve close normally.

(4) The four-way pneumatic valve shall be ASCO No. 8316 or approved equal.

6.07 Standard Gate Valves: All standard gate valves 3" and larger shall be for flanged or "hub" ends, mechanical joint or push on type to conform to the type of C.I. pipe elected to be used by the Contractors for Divisions One and Two. See plans for type of C.I. pipe joints indicated. All gate valves shall conform to latest specifications of the A.W.W.A. Designation C500-52T, shall be equipped with "O" ring packing where possible and shall be as follows:

(a) General Construction: Gate valves shall embody the best class of workmanship and finish, and shall open and close freely and easily. In closing the gates shall move to their position opposite the ports, both discs being then closed squarely against the seat rings. With discs raised, each valve shall have a clear water way of the full nominal diameter of the valve. All wearing and bearing faces shall be suitably

proportioned, and all working parts shall be of bronze, or bronze mounted. The seats and face rings for the valve discs shall be of satisfactory dimensions, according to the best shop practice, and the seat rings shall be faced in a lath, to a true and even surface, so as to form a watertight joint when drawn together; and if such joint cannot be produced by machine work, then the faces shall be dressed, and with disc ground to its own true bearing without the aid of templates. Such face rings shall be securely screwed into the recesses made therefor in the valve case. The face rings of the discs shall be machined, dovetailed or driven into corresponding machined grooves in the discs of gates and riveted on with suitable non-corrodible metal rivets.

(b) Working Pressure: Gate valves shall be furnished for 175 psi, water working pressure.

(c) Operation: All valves shall open left. Valves shall be operated by nut. Operating nuts shall conform to present local standards, and shall have an arrow cast on them, indicating the direction for opening the valve.

(d) Marking: Each valve shall be plainly marked with the manufacturer's name or particular mark, the year of manufacture, the size of the valve, and designation indicating working pressure, all cast on the bonnet or body.

(e) Installation: All gate valves shall be furnished for vertical installation, N.R.S., with operating nut.

(f) Testing: All gate valves shall be tested in accordance with American Water Works Association standards.

(g) Valve Boxes: All buried gate valves shall be equipped with valve boxes. Valve boxes shall be heavy roadway type. The valve boxes shall be cast iron two-piece slide type with drop covers. The word "water" shall be cast in raised letters on the covers. The valve boxes shall be adjustable to 6" up or down from the nominal required cover over the pipe.

(h) Manufacture: Valves shall be furnished as manufactured by Mueller Company, A. P. Smith, Ludlow, or approved equal.

6.08 Coating: All interior piping systems and valves shall be furnished primed and shall be painted on the job. Pipe fittings or valves previously coated with asphalt paint will not be acceptable.

6.09 Outside Piping: Piping materials and uses shall be as follows:

(a) Cast Iron Pipe: Cast iron pipe shall be used in sizes from 2-inch through 12-inch.

(b) Ductile Iron Pipe: Cast iron or cast ductile iron pipe shall be used in sizes 16-inch and larger. Plans refer to cast iron and ductile iron pipe as "C.I." Laying provisions are the same as for cast iron.

(c) Clay Pipe: Clay pipe may be used in sizes 8" through 18" for non-pressure non-potable service.

(d) Concrete Pipe: Concrete pipe may be used in sizes 8" and above for non-pressure, non-potable service.

6.10 Cast Ductile Iron Pipe: Cast ductile iron pipe shall be furnished in accordance with the Standards of the American Water Works Association C151-65 except as otherwise provided herein.

(a) Joints: Joints for cast ductile iron pipe shall be push-on type joints similar to American Cast Iron Pipe Company's "Fastite" Joint, with continuous rubber ring gasket. Joints for fittings shall be standard mechanical joints as detailed in American Standard A21.11 of latest revision.

(b) Size, Thickness Class, and Bedding: Ductile cast iron pipe, size, thickness class and bedding shall be as follows:

Pipe Size Inches	Minimum Thickness Inches**	Thickness Class	Maximum* Depth of Cover	Cement Lining Thickness
42	0.52	2	8	.125
42	0.64	4	12	.125
42	0.76	6	16	.125
36	0.46	2	8	.125
36	0.56	4	12	.125
36	0.66	6	16	.125
30	0.40	2	8	.125
30	0.48	4	12	.125
30	0.56	6	16	.125
24	0.37	2	8	.094
24	0.40	4	12	.094
24	0.43	6	16	.094
20	0.32	1	8	.094
20	0.38	3	12	.094
20	0.41	4	16	.094
16	0.30	1	8	.094
16	0.33	2	12	.094
16	0.36	3	16	.094
16	0.42	5	20	.094
12	0.30	2	12	.094
12	0.33	3	20	.094

* Depths of cover greater than those listed above will require special sand bedding and use of the thickest listed wall.

** Manufacturers tolerances shall be added to minimum thickness so that no thickness is less than specified.

(c) Lining: The interior lining for cast ductile iron pipe and fittings shall be spun cement mortar in accordance with AWWA C-104 of latest revision.

(d) Outside Coating: The outside coating for cast ductile iron pipe and fittings shall be a bituminous coating of either coal-tar or asphalt base approximately one mil thick.

(e) Marking Pipe: The weight, class and casting period shall be shown on each pipe. The manufacturer's mark, the year produced and the letter DI shall be cast or stamped on each pipe. All marks shall be clean and legible and all cast marks shall be near the bell.

(f) Certification: The manufacturer of cast ductile iron pipe shall furnish the Engineer and Owner with certification that the inspection and specified tests have been made and that the results thereof comply with the requirements of ASA A21.51-1965.

(g) Fittings: Fittings for cast ductile iron pipe shall be either cement-lined cast gray iron or cement-lined cast ductile iron. Cast gray iron fittings shall meet the requirements of the American Water Works Association Standard C 100-55 of latest revision except as otherwise specified herein. Cast ductile iron fittings shall meet the same requirements as gray iron fittings. All fittings shall be mechanical joint. All bends except 90 degrees bends shall be short radius. 90 degree bends shall be long radius in sizes 24-inch and larger, short radius for smaller sizes. Access manhole covers shall conform to AWWA C-208-59.

(h) Outlet Saddles: Outlet or tapping saddles furnished where shown on the drawings shall be ductile iron 60-45-10 or 80-60-03, furnished with corrosion resistant alloy steel straps meeting the requirements for bolts and nuts in AWWA C111-64. All outlet saddles shall be installed and the pipe tapped prior to shipment by the manufacturer. Outlets may be factory installed by other methods approved by the Engineer.

(i) Cutting Pipe: Ductile iron pipe shall be cut to length by the manufacturer in accordance with his approved laying schedule. Pipe cuts shall be made only with an approved saw or lathe cutter. The manufacturer may make arrangements with the Contractor for the installation of pipe to make cuts or install saddles or taps in the field at no cost to the Owner.

6.11 Cast Iron Pipe: Cast iron pipe shall conform to Federal Specification WW-P-421a as to general requirements, material, workmanship and tests. Fittings shall be ASA Standard of class equal to the ASA Class of the pipe, cast iron for cast iron pipe. Pipe shall be lined with approximately 1/8" standard cement lining and shall be coated inside and out with an approved coal-tar coating. No pipe will be accepted which is less than standard weight by more than 4%. Class designations shall be cast on the pipe and fittings and weights shall be painted on the outside. Thickness class shall be ASA 22 unless otherwise specified. All applicable provisions of Paragraph 7.03 shall be met. Class 150 pipe shall be used for the high service pump connection.

6.12 Clay Pipe: Clay pipe shall be A.S.T.M. Designation C13-57T or C200-59T with gasket couplings conforming to A.S.T.M. Designation C425-60T, Type III.

6.13 Concrete Pipe: Concrete Pipe shall be A.S.T.M. Designation C14-60, C76-59T Class 3 or 4 as applicable with "B" wall thicknesses. Three-edge bearing strength shall be as specified later for a .01" crack. Joints shall be O-ring rubber gasket type conforming to applicable provisions of A.S.T.M. Designation C361-55T for low head pressure pipe. For drain lines laid on a radius, joints shall be beveled as required.

6.14 General Provisions for Laying Cast Iron Pipe Lines: The Contractor shall

lay all pipe and fittings to accurately conform to the lines and grades established by the Engineer and as follows:

(a) Handling: Proper and suitable tools and equipment, for the safe and convenient handling and laying of pipe shall be used, and great care shall be taken to prevent the pipe coating from being damaged, particularly the cement lining on the interior of the pipe. All pipe shall be carefully examined for cracks and other defects, and no pipe or casting shall be laid which is known to be defective. If any pipe or other casting is discovered to be cracked, broken, or defective, after being laid, it shall be removed and replaced with sound material, without further charge. All pipe and fittings shall be thoroughly cleaned before being laid, and shall be kept clean until accepted in the complete work.

(b) Alignment and Gradient: Pipe line alignment and gradient shall be straight, or shall follow true curves as near as is practicable. Curvature in pipe lines, where required shall be well within the allowable laying radius; horizontal or vertical.

(c) Sequence of Work: Excavation, cleaning, laying, jointing, and backfilling shall be kept up as closely as is possible so as to progress the work in a uniform, workmanlike manner. In no case shall pipe be left in the trench overnight without completing jointing. The completed pipe line shall not be left exposed in the trench unnecessarily and the Contractor will be required to backfill and compact the trench as soon as is possible after laying and jointing is completed. Each day at the close of work, and at all times when laying is not in progress the exposed end of the pipe line in the trench shall be closed by the use of an approved head or barrier of wood or metals. If at any time it becomes necessary to cover the end of an uncompleted pipe line with backfill, the end of such pipe shall be closed using a mechanical joint plug.

(d) Cleaning: The Contractor shall clean each joint of pipe while it is suspended before it is lowered into the trench.

The Contractor shall keep exposed ends of pipe properly plugged during laying to prevent dirt and other materials entering the line, and he shall also, before the system is accepted, thoroughly clean all lines.

(e) Laying Pipe in Trenches: When laying pipe in trenches care shall be taken to give the pipe solid bearing throughout its entire length, and the earth used in refilling trenches, from the bottom of the trench, under and up to two (2') feet over the top of the pipe line shall be of selected material, carefully packed, tamped and rammed with proper power tools for the purpose.

(1) Pipe Lines in Earth Trenches: Where pipe is laid in earth excavated trenches the bottom of such trenches shall be fine graded by skilled workmen to a true line, and pipe lines shall not be laid on loose rock, or other hard material, but shall be bedded on fine, clean undisturbed earth. Over excavation in the bottoms of trenches shall be backfilled to grade.

(2) Pipe in Rock Trenches: Where pipe is laid in rock trenches it must be bedded in at least six (6") inches of clay or sand. The

trench must be backfilled with the same material to a level at least two (2') feet over the top of the pipe.

(f) Blocks or Wedges: Wherever required by the Engineers, suitable wood blocks or wedges shall be furnished and placed, for laying pipe, without further compensation other than the unit prices bid for installation of pipe and fittings.

(g) Pipe Lines Encased in Concrete: Cast iron pipe and fittings indicated on the drawings to be encased in concrete may be encased in Class "C" concrete and shall be encased as indicated on the drawings. Such pipe and fittings for encasement in concrete shall be properly supported on pre-cast concrete saddles.

(h) Mechanical Jointing: Mechanical joints shall be made only by experienced mechanics. Sockets and spigots shall be washed with soapy water before slipping gland and gasket over spigot. The spigot shall be inserted in the socket full depth. The gasket shall be brushed with soapy water and shall be pushed into position making sure the gasket is evenly seated in the socket. The gland shall be slid into position for compressing gasket. All bolts and nuts shall be tightened "finger-tight"; after which bolts shall be tightened to a uniform permanent tightness using a torque wrench for tightening. Bolts shall be tightened alternately 180 degrees apart. Sockets, spigots, gaskets, glands and bolts shall be kept clean and wet with soapy water until each joint is completed. Suitable bell holes shall be cut in the bottom of the trench where the joints come in order to secure a uniform bearing of the pipe in the trench.

(i) Push-on type joints shall be made in accordance with manufacturers' directions.

(j) Blocking: All cast-iron pipe lines shall be adequately blocked. Blocking for pipes 12" and under shall be as shown on the drawings. Pipes 12" and over shall have specially designed blocking. Blocking may be thrust type, mass type or on piling. Blocking not shown on the plans will be designed by the Engineer and payment will be made under unit prices in the unit price items of the Proposal, to design dimensions.

6.15 General Provisions for Laying Clay and Concrete Pipe: Clay and concrete pipe are to be used exclusively for gravity lines containing non-potable water. Excavation for pipe trenches shall be paid for under lump sum prices included in the Proposal except for rock which shall be paid for under unit prices bid in the Proposal. The top portion of trenches may be excavated to any width which will not cause damage to other structures or impair blocking for other pipelines. The lower portion of the trench shall not be excavated wider than widths specified for a height at least two feet over the top of the pipe.

(a) If trenches are excavated to widths in excess of the above limitations, or collapse because of insufficient bracing and sheeting, the Contractor will be required to use special methods of constructing pipe foundations and backfilling as specified herein at his own expense.

Trench excavation shall not advance more than six hundred feet ahead of pipe laying unless permitted by the Engineer because of wet ground or

probable delay in making deep excavations.

The bottom of all trenches, except as otherwise specified shall be rounded to conform to the bottom of the pipe so as to afford full bearing on the pipe barrel. The depth and width required for such shaping shall be directed by the Engineer.

Excavation in excess of depth required for proper shaping shall be corrected by one of the special methods specified herein, as ordered by the Engineer. Bell holes shall be excavated so as to relieve pipe bells of all load, but small enough to insure that support is provided throughout the length of the pipe barrel.

Excavation in excess of the depths required for manholes and other structures shall be corrected by pouring a sub-foundation of Class "C" concrete at the Contractor's expense.

(b) Rock Excavation and Blasting: Refer to Section 3 of these specifications.

(c) Dewatering Trenches: All excavation shall be dewatered properly before laying pipe. Where running sand is encountered, dewatering shall be done by well pointing whenever possible. Where soil conditions are not favorable for use of well point, french drains of crushed stone or gravel shall be constructed to suitably located sumps and the water removed by bailing or pumping. All costs of equipment, labor and materials required for dewatering shall be included in the prices bid for sewers.

(d) Crushed Stone Fill: Wherever the subgrade is by nature too soft or mucky, in the opinion of the Engineer, for the proper installation of the sewer, he may order the Contractor to undercut the ditch and backfill with crushed stone or gravel, 3/4" in size and less. The stone so placed shall be brought to grade and compacted. No separate payment will be made for crushed stone backfill, material or under cutting of ditch to remove the unsuitable subgrade materials.

(e) Bracing and Sheeting: The sides of all trenches and excavation for sewers and structures shall be securely held by stay bracing, or by skeleton or solid sheeting and bracing, as required by the soil conditions encountered, unless otherwise permitted by the Engineer.

Bracing and sheeting may be removed in units when the level of the backfilling has reached the elevation necessary to protect the pipe work and adjacent property. Sheeting near the bottom of trenches over ten feet deep, for sewers 15-inch size and larger, shall remain in place and shall be cut off not less than two feet above the top of the completed sewer. When, in the opinion of the Engineer, sheeting or shoring above this level cannot be safely removed, it shall be left in place and the Contractor will be paid for the sheeting or shoring so left in place at the prices bid. Sheeting so ordered to be left in place shall be cut off at least two feet below the surface. No lumber for shoring or bracing exceeding that size customarily used, will be paid for unless the use of larger size shall have been ordered in writing by the Engineer.

(f) Backfilling: All trenches and excavation shall be backfilled immediately after the pipes are laid therein, unless other protection of

the pipe line is directed. The backfilling material shall be selected and deposited with special reference to the future safety of the pipes. Except where special methods of bedding and tanping are provided for, clean earth, sand or rock dust shall be solidly tamped about the pipe up to a level at least two (2') feet above the top of the pipes, and shall be carefully deposited in uniform layers, each layer solidly tamped or rammed with proper tools so as not to injure or disturb the pipe line. The remainder of the backfilling of the trench shall be carried on simultaneously on both sides of the pipes in such a manner that injurious side pressures do not occur. After placing the backfill up to a level slightly below the natural ground surface, surplus excavation shall be windrowed and maintained in a suitable manner to concentrate and pond surface runoff from rains over the trench; after sufficient settlement has been obtained, in the opinion of the Engineer, the Contractor shall complete the dressing, removal of surplus materials and surface clean-up in accordance with these specifications. Backfilling across roads and streets shall be as specified for replacing of pavement.

Walking or working on the completed pipe sewers, except as may be necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least two (2') feet over the top of the pipes.

Whenever the trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the surface of the ground. Backfilling shall be carefully performed and the original surface restored to the full satisfaction of the Engineer. Backfill in open trenches across sidewalks and roadways shall be made as above specified, except that fill above pipes shall be deposited in layers not to exceed 6 inches and thoroughly compacted as provided elsewhere in these specifications. Surplus material shall be disposed of as directed by the Engineer.

(g) Alignment and Grade: All gravity lines are to be laid accurately to grade using batter boards where possible. Pipe shall be laid up grade with the spigots pointing downgrade.

(h) Joining Pipe: No joints shall be made where surfaces of pipe and bell to be joined have been soiled by earth in handling.

(i) Laying Pipe: All sewer pipe shall be laid up grade with the spigots pointing down grade. The pipe and specials shall be so laid in the trench that after the sewer is completed the interior surface shall conform on the bottom accurately to the grades and alignment fixed or given by the Engineer.

No joints shall be made where surfaces of pipe and bell to be joined have been soiled by earth in handling, until such soiled surfaces are so thoroughly cleaned by wire brushing and wiping that all traces of earth are removed. The interior of the pipe shall be carefully freed of all dirt and superfluous material of every description, as the work proceeds.

All pipe shall be carefully examined for cracks or other defects and no pipe shall be laid which is found defective. If any pipe is found to be defective after being laid, it shall be removed and replaced with sound pipe without further charge.

The surfaces of pipe to be joined as well as the rubber gaskets shall be cleaned and lubricated with a vegetable soap or other lubricating agent as recommended by the manufacturer. Whatever lubricating agent is used it shall not be injurious or detrimental to the rubber gasket. After each joint is installed the gasket shall be checked for proper position prior to installation of the succeeding length of pipe.

No pipe shall be laid on blocking of any kind, except by express permission of the Engineer, and then only at manholes or other structures where temporary blocking may facilitate installation of the pipe. After installation of the pipe such blocking shall be carefully removed and all voids left by the blocking shall be filled with selected material and tamped.

(j) Closing Pipe: When the work of pipe laying is suspended, either for night or at other times, the end of the sewer must be closed with a tight cover. The Contractor will be held responsible for keeping the sewer free from obstruction.

(k) Leakage: The allowable limit of the leakage of ground water into sewers shall not exceed the following rates of infiltration:

(1) 0.10 gallons per inch diameter per foot of pipe per day for any stretch of sewer between adjoining manholes.

(2) 0.08 gallons per inch diameter per foot of pipe per day for any sewer, or system of sewers, one mile or less in length.

(3) 0.05 gallons per inch diameter per foot of pipe per day for any trunk sewer, or sewer system, the total length of which is greater than one mile.

Leakage tests shall be made only when the ground water table is above the top of the sewer pipe and after all visible leaks have been stopped. In case the leakage exceeds the rates above specified, the sewer shall not be accepted until so repaired that it will comply with these requirements.

(l) Testing and Cleaning: Before acceptance of the sewer system, same shall be tested and cleaned to the satisfaction of the Engineer. Where any obstruction is met, the Contractor will be required to clean the sewers by means of rods or swabs or other instruments. The pipe line shall be straight and show a uniform grade between the manholes.

(m) Manholes: Manholes shall be constructed at such points as may be designated according to plans and directions given. In all cases the channel shall be smooth and properly rounded. Special care must be exercised in laying the channel and adjacent pipes to grade. The connection of the sewer with the wall and channel of the manholes shall be tight and smooth.

The first length of pipe for future lateral sewers of such size as may be designated, shall be inserted and laid to proper grade alignment. The stub end shall be plugged as specified under "Laying Pipe". All costs for furnishing and laying this pipe will be included under unit prices bid for manholes.

The top of manholes outside of roads, streets and highways shall be built to grades 12" above ground surface unless otherwise shown on the plans. Manholes in roads, etc., shall be built to grades designated by the Engineer.

The bottom of each standard brick manhole shall be built of Class "B" concrete and the walls of the manhole shall be built of whole hard burned brick of good quality laid in cement mortar made of one part cement and two parts clean sharp samd. Cement shall be 75% Portland and 25% Puzzolan. Immediately before laying, the brick shall be thoroughly saturated with water. Every brick shall be carefully imbedded in mortar on its bottom and sides, and the walls shall be thoroughly plastered on the outside with a smooth coat of 1:2 cement mortar.

Reinforced concrete slabs for other manholes shall be built of Class "A" concrete in accordance with typical details shown on the drawings.

Brick drop manholes shall be built at locations shown on the plans or as directed by the Engineer, and shall conform to details shown on the plans.

Manhole frames, covers and steps shall be as shown on the plans.

(n) Earth Fill Over Pipe: Where called for on the plans or as otherwise directed by the Engineer, in locations where little or no cover is obtained for sewers, a special earth fill conforming to the details shown in the plans will be placed to provide the necessary protection to the sewer line. Earth used for such fill shall be free from large pieces of rock and shall be carefully placed to avoid damage to the sewer line. It shall be placed in layers around and over the pipe and compacted through the use of hand tools. Earth moving equipment will not be permitted to drive over the line of sewer.

6.16 Strength and Thickness of Pipe: Pipe is to be classified into two classes, standard strength and extra strength. These classes will be used to determine the thickness or strength required for each depth of cut and type of trench condition. Concrete pipe is Class III for standard strength and Class IV for extra strength. All sewer pipe when tested by the 3-edge bearing method in accordance with the standard specifications designated shall have a minimum strength of not less than those tabulated hereinafter. The minimum strengths tabulated are defined as the crushing strength of clay pipe and non-reinforced concrete pipe, and as the load to produce a 0.01 inch crack in reinforced concrete pipe. Thickness of pipe walls or minimum strengths of pipe shall be not less than shown in the following tabulation.

Thickness and/or Minimum Strength of Pipe

Interior Dia.	Concrete or Clay Minimum Strength Std. S.	E.S.
8	1,300	2,000
10	1,400	2,000
12	1,500	2,250
15 or 16	1,690	2,500
20 or 21	2,360	3,500
24	2,700	4,000
30	3,375	5,000
36	4,050	6,000
42	4,725	7,000
48	5,400	8,000
54	6,080	9,000
60	6,750	10,000

6.17 Allowable Trench Depths for Various Classes of Pipe: Pipe may be bedded in one of three ways depending on the strength and size as follows:

(a) Class "D" Bedding: Class "D" bedding consists of a flat bottom trench with bell holes, and is permissible only for clay or concrete pipe in sizes 8", 10" and 12" in ditches not over 9' in depth.

(b) Class "C" Bedding: Class "C" bedding consists of a trench with a shaped bottom trimmed by hand to conform to the pipe barrel for at least one-fourth its circumference or methods as shown on the plans.

(c) Class "B" Bedding: Class "B" bedding consists of a trench cut below the bottom of the pipe and brought to proper level by spreading and tamping thoroughly a layer of fine granulated material to conform accurately to the bottom one-fourth of the barrel. The trench shall then be backfilled and hand tamped with thin layers of the same material to a height of three-fourths the pipe diameter. The remainder of the trench shall then be backfilled as previously specified. Other methods are shown on the Plans.

(d) Class "A" Bedding: Class "A" bedding is a concrete bedding in which concrete is poured to full trench width a height of one-fourth the nominal pipe diameter above the invert. This type of bedding will be required for all pipe in cuts with finished grade 30' or more above the pipe invert. All pipe used with Class "A" bedding shall be extra strength. Other methods are shown on the plans.

Type of pipe required for various cuts and type of bedding is as follows:

Pipe Size	Maximum Trench Width	Class Pipe	Bedding Method D	C	B
8"	2' - 2"	S. S.	6	12	18
8"	2' - 2"	E. S.	9	30	30
10"	2' - 4"	S. S.	6	13	17
10"	2' - 4"	E. S.	9	30	30
12"	2' - 6"	S. S.	6	13	17
12"	2' - 6"	E. S.	9	30	30
15" or 16"	2' - 10"	S. S.	6	11	14
15" or 16"	2' - 10"	E. S.	9	21	30
18" or 20"	3' - 6"	S. S.	6	11	15
24"	4' - 0"	S. S.	6	10	14
24"	4' - 0"	E. S.	9	20	30

6.18 Backfill Drains: Clay pipe C211-57T except with 8 perforations per 3", or concrete pipe, self aligning type with similar perforations ASTM C14-60.

6.19 Valve Boxes: Valve boxes shall be heavy roadway type cast iron two piece slide type with drop covers. The word "Water" or "Sewer" shall be cast in raised letters on the cover, depending on service. Valve boxes shall be adjustable up or down.

6.20 Pipe Railing: Pipe railing shall be galvanized iron pipe, 1-1/2" size, with welded fittings. All railing posts shall be set in pipe sleeves to a depth of 4-inches and furnished with escutcheon plates when used with tile floors.

6.21 Yard Hydrants: Yard hydrants shall be 1-1/2" Mueller A-24059 or equal.

6.22 Small Pipe and Valves: Pipe smaller than 2-inches shall be galvanized steel, with threaded joints, Schedule 80. Valves shall be 150 psi, brass globe and angle valves with plug type disc.

6.23 Sterilizing Pipe Lines: All pipe lines and equipment for water supply shall be sterilized as approved, and under the direct supervision of the Engineer. Pipe lines shall remain filled for a twelve hour period with a solution of water and chlorine of 70 per cent grade HTH in amounts equivalent to at least 50 parts per million. The Owner will supply the HTH and the Contractor the means of application plugs etc. Sterilized lines will be tested biologically and re-sterilization will be required if unsatisfactory.

6.24 Payment: No separate payment will be made for work under this specification, except as may be specifically set forth in the Proposal. The cost of such work and all cost incidental thereto, except such work as may be specifically set forth in the Proposal, shall be included in the price bid for the item to which the work pertains.

SECTION NO. 7

BUILDINGS AND BUILDING SPECIALTIES

7.01 Scope of Work: The scope of the work included in this section of the Specifications consists of the furnishing of all materials, labor and equipment necessary for the satisfactory completion of all buildings, building superstructures, building specialties, laboratory and office furniture, laboratory equipment, hardware, building specialties and furnishings as specified herein or shown on the drawings.

7.02 Roofing and Sheet Metal: All materials shall be new and of first-grade quality and shall conform to the specifications given below. Workmanship shall be first class.

(a) Built-Up Roofing: Built-up roofing shall be a twenty-year bond, tar or asphalt-felt-gravel type, 4 ply, Barrett Black Diamond Roof No. 220-NO for precast concrete slabs and No. 220-C for poured concrete slabs, or approved equal. A five-year maintenance bond for full value of the roofing and flashing in place shall be issued by the Surety Company and furnished by the General Contractor. All built-up roofing shall be laid strictly in accordance with published instructions of the approved roofing material manufacturer.

(b) Felt: Federal Specification HH-F-191, Type 2.

(c) Coal Tar Pitch: Federal Specification R-P-381, Type 1.

(d) Asphalt: Federal Specification SS-A-666.

(e) Nails: Aluminum.

(f) Sheathing Paper: Federal Specification UU-P-536 for "Paper, Sheathing, Waterproofing", Grade "A".

(g) Metal Flashing: Aluminum, 0.032-inch thick; Reynolds Metal Company, or equal, flashing.

(h) Gutters, Downspouts, and Conductor Heads: Aluminum, 0.05-inch thick.

(i) Insulation: "Foamglas" by Pittsburgh-Corning, 1-1/2 inch thick, rigid, bonded to both roof deck and roofing.

(j) Gravel: Pea Gravel, washed and clean; slag or crushed stone, 3/16 inch to 1/2 inch in size.

7.03 Laying Insulation and Built-Up Roofing: The roof and all materials shall be dry. All unfinished work shall be covered with plastic sheets or canvas at night or as may be necessary to prevent wetting by rain or dew. Rigid insulation shall be firmly embedded in the hot bonding material as used for the layers of felt. Lay insulation in parallel courses with staggered joints and joints tightly butted.

Flashing shall be provided around all parapets and openings in roof as shown on the drawings. Provide gravel stops at edges, extended down to cover

edge of the roof deck or into masonry walls and extended back on roof. Steps shall be crimped 5/8 inch high or higher as necessary to retain the gravel, and securely fastened, then stripped with felt and mopped down. Felt flashing shall be installed in accordance with specific instructions of the roofing material manufacturer.

7.04 Spandrel and Sill Flashing: Spandrel flashing shall, in general, be installed at all spandrel beams and sills.

Where necessary to pass anchors through sheets, holes shall be no larger than the anchor cross section. Such holes shall be properly waterproofed with plastic cement.

All flashings shall be applied only to dry surfaces, free from loose materials and slopes or pockets which would prevent free drainage to the weather side.

Surfaces receiving flashing shall be thoroughly brush-coated with asphalt or trowel-coated with plastic cement and the sheet completely embedded in the coating. All laps in sheets shall be not less than 4 inches. Sheets shall be of sizes as will avoid as much as practicable the necessity for lapping.

Flashing sheets, not exposed, shall be turned up not less than 3 inches at backs of walls and shall extend to within 1/2 inch of exposed wall faces at lower edges.

7.05 Brick and Concrete Masonry Units:

(a) Scope: Work under this heading consists of furnishing all material and equipment and performing all labor necessary to properly install all brick, concrete masonry units and structural glazed tile units as shown on the drawings and/or called for in these Specifications.

(b) General:

(1) Requirements of Other Trades: Furnish and install all sheet metal, anchors, miscellaneous metal, wood, blockouts, blocking, backing, etc., where required.

(2) Storage of Materials: Store cement and lime in a manner to afford ready access and to protect from dampness. Concrete masonry units delivered to the site shall be dry enough to comply with the specified limitation for moisture content, and shall be maintained in this condition, prior to laying in the structure, by storing them above the ground and by covering them for protection against wetting. Unprotected units which have been wetted by rain within the preceding seven days shall be considered too wet to use unless otherwise shown by test.

(3) Metal Reinforcement delivered to the site and not immediately used in construction shall be placed on supports at least eighteen (18") inches above the ground.

(4) Cutting and Patching: Consult trades in advance and make provisions for installations to avoid cutting and patching. No chases in walls will be permitted.

(c) Samples: Submit the following samples for the Engineer's inspection:

Heavyweight concrete masonry units: Types proposed for use.

Brick: All shapes and types in sufficient number to show range of color.

Samples must be approved by the Engineer before materials are incorporated in buildings.

(d) Materials: Materials shall conform to the following:

(1) Concrete Masonry Units shall be heavy aggregate concrete blocks conforming to A.S.T.M. Specification C-90-52, Grade A. Aggregate shall be sand and gravel or crushed stone. All unsuitable blocks shall be rejected. The Contractor shall furnish corner blocks, jamb blocks, units cast to special shape and all other blocks necessary to complete the job. Corner units shall be bullnose where required.

The manufacturer shall certify that all units furnished have been made, cured and dried in accordance with A.S.T.M. Specifications. Written reports of tests conducted by a recognized independent testing laboratory shall be furnished the Engineer. At least 5 units shall be tested out of every 10,000 units delivered.

(2) Mortar Materials shall be accurately measured and mixed in mechanical mixer for a period of not less than two minutes.

Sand: Use well screened sand, clean, hard, sharp, siliceous, free from loam, silt or other impurities, and of grains of varying sizes within the following limits:

#10 Sieve	Passing 95-100%
#50 Sieve	Passing 15-40%
#100 Sieve	Passing 0-19%
Removal by Decantation	

Colorimetric test shall show color no darker than standard. Mortar sand shall conform to A.S.T.M. Specifications for Aggregate for Masonry Mortar C-144.

Cement: Use only one brand of Portland, Masonry or Slag cement.

Portland Cement	Fed. Spec. SS-C-192-A, Type I.
Masonry Cement	Fed. Spec. SS-C-181-b.
Slag Cement	"Magnolia" or equal.

Lime: Hydrated - Fed. Spec. SS-L-351, Type M.

Lime Putty: Prepare as follows:
Mix hydrated lime with water to form putty and store with care to prevent evaporation for 24 hours before use.

Water: Water shall be fresh, clean, fit to drink, and free from acid, alkali, sewage or organic matter.

Mortar for masonry shall be one of the following:
One bag of Portland cement weighing not less than 94 pounds; and one bag of Slag cement weighing not less than 80 pounds, shall be considered as 1 cubic foot.

A. Portland Cement Mortar
    1 part Portland Cement
    1 to 1-1/4" parts Lime Putty
    4 parts Sand (in damp, loose condition)

B. Slag Cement Mortar
    1 part Slag Cement
    1 part Lime Putty
    6 parts Sand

C. Masonry Cement Mortar
    1 part Masonry Cement
    2 to 3 parts Sand (in damp, loose condition)

Mortar for exterior brick shall be waterproofed with Truscon Mortite Waterproofing or equal. Proportion waterproofing in accordance with manufacturer's recommendations.

(3) Cores in concrete masonry units, where shown to be filled shall be filled with masonry mortar.

(4) Metal Reinforcement use in concrete masonry wall construction shall conform to applicable provisions of A.S.T.M. Specification for Metal Reinforcement in Reinforced Concrete Construction.

(5) Anchors and Ties: Furnish and install all anchors and ties required, including galvanized dovetail and zinc coated mesh reinforcing for joints.

(6) Face Brick used for exterior of building walls shall be free from warpage, distortion, cracks, or other blemishes that would affect appearance in completed work. Brick shall be standard size, 8" x 2-1/4" x 3-3/4" face brick, conforming to A.S.T.M. Specification C-216-48T, Grade SW. Allow the sum of $60.00 per thousand for face brick. Sales tax and cost of delivery from Athens to job site will not be included in allowance, but should be covered in the lump sum bid for the work. Back up brick and manhole brick shall be No. 2 common whole, hard burned brick of good quality. Credit to the Owner, or to the Contractor for cost greater than the allowance shall take into account sales tax. Overhead and profit will be excluded. Cost will be based on calculated quantities plus 3% for breakage in handling.

(e) Laying Brick: Lay no masonry that may be endangered by freezing. If absorption is greater than 12% soak brick for 24 hours and allow surface film of moisture to evaporate before laying.

Lay brick plumb and true to level courses. Walls shall be bonded with headers and stretchers every sixth course, unless otherwise shown on the drawings. Layout courses with a story rod and space courses accurately.

Bond shall be plumb. Lay out and adjust so that courses will terminate at corners or openings with not less than 1/3 of a brick.

Where new work is shown to be joined to old, step back for joining. Brickwork may be toothed only when directed. Remove all loose mortar, clean thoroughly and wet face of all work before joining new work to old.

Lay face work in natural color mortar joints, formed with suitable tools. After initial set, tool concave joints in face work. Width shall be approximately 3/8" so as to obtain a height of 8" for three brick courses.

Cut interior wall joints flush and point smooth for painting. Provide anchorage from concrete to brickwork with galvanized dovetail anchors, 14 gauge, every third course, with 24 gauge slots spaced 24 inches on centers.

All cutting and fitting to make connections with other types of work shall be promptly done by the Contractor, and he shall carefully set or build in all wall plates, columns, beams, arches or other iron work. He shall also carefully build in all electric conduits, wooden grounds and other materials, equipment and fixtures as may be required.

Carefully cover, box and protect all walls and work in bad weather. Place suitable boxing where the work is liable to injury and in the manner directed by the Engineer. Any damaged or unsatisfactory work must be promptly removed and replaced by the Contractor at his expense.

On completion of the building, the Contractor shall clean the faces of all brick walls with dilute muriatic acid and water, carefully applied with a scrubbing brush. Any pointing up or other work necessary to place the walls in first class condition, shall be done by the Contractor at the same time.

The Contractor shall erect a sample panel of brick at least 3' x 4' showing jointing, bond, etc. The sample must be approved by the Engineer before any brickwork on building is laid.

(f) Concrete Masonry Wall Construction:

(1) Workmanship: All masonry walls shall be true and plumb and built to the thickness and to the bond or pattern indicated on the drawings. Where no bond or pattern is indicated the walls shall be laid in straight uniform courses with the units in the course above regularly breaking joints with the course below. All workmanship shall be of the highest grade.

(2) Sample Panel: Contractor shall erect on the site of the project, where it will remain undisturbed until completion of the job, a sample panel 4 ft. by 4 ft. minimum size, using the concrete masonry units, bond, or pattern, and the kind of joints to be employed in the project, including a sample of the treatment to be given - paint or plaster. Upon visual inspection approval of the sample panel subsequent work shall conform to the same.

Concrete masonry units shall not be wetted prior to laying in the structure except upon written approval of the Engineers. At the

stoppage of work at any time the top of construction shall be covered to prevent rain from entering the cores of the units.

(3) Reinforcing: Horizontal joints in all concrete block interior and cavity walls shall be reinforced a maximum of every 24". Reinforcing shall be located as directed by the Engineer. Reinforcing shall be "Dur-O-Wall" with 3/16 side bars, or equal.

(4) Mortar Joints: Standard thickness of mortar joints for both horizontal and vertical joints shall be 3/8 inches. Vertical joints shall be shoved tight. Full mortar bedding shall be used in the construction of concrete masonry columns and pilasters; for all other concrete masonry work, face shell bedding shall be used with complete coverage of face shells. Furrowing shall not be permitted. Mortar joints shall be stuck off flush with wall surface and when partially set shall be compressed and compacted to a smooth flush joint.

(5) Brick Veneer facing shall be bonded to concrete masonry backing with galvanized dovetail anchors spaced 16" vertically and 4'-0" horizontally staggered.

(6) Cut openings in concrete block neatly around all wall outlet boxes so that openings are covered by plates.

(g) Caulking as shown on plans and specified shall be delayed as long as practicable. Caulking shall proceed in the following order: An approved priming material shall be applied to the contact surface. Caulking shall then be placed in an acceptable manner. Before application of paint finish all caulking material shall be covered with an approved priming material.

(h) Protection: Properly protect masonry from all damage, including frost action and rain by use of strong waterproof membrane.

(i) Pointing, Cleaning, Etc.: On completion of work, point up and clean exposed masonry, using acid solution, 5% muriatic, and stiff fiber brushes. Before and after cleaning, masonry shall be thoroughly rinsed with clean water.

7.06 Precast Concrete Trim: Precast concrete trim shall consist of sills, coping blocks as shown on the drawings. The mix shall be 1:2:4 using six bags of white Portland cement per cubic yard. Materials shall be as specified under Section No. 3. Precast concrete shall match exterior limestone.

Beds and joints shall be full and square the full depth and scored to within 1 inch of the face. Provide holes and sinkages for anchors. Lug sills shall be bedded at the ends only and, after the walls are built, joints under the sills shall be filled and pointed with a light colored elastic pointing compound.

7.07 Structural Glazed Tile: Structural glazed tile shall be used for the interior surfaces of walls and partitions as shown on the drawings. Tile shall be select quality, ceramic glazed and smooth unglazed structural full load bearing, face tile. Field colors shall be as selected by the Engineer. All units shall conform to the Specifications of the Facing Tile Institute, and shall be of the highest structural and mechanical quality. Shading shall be consistent with manufacturing process and approved samples.

The nominal face sizes of structural facing tile and fittings shall be 5-1/3" x 12", Series 6-T, nominal thicknesses of 2", 4", and 6".

Shapes shown on the Facing Tile Institute catalog shall be furnished as required by the plans for a complete job. In general all exterior corners, sills, jambs, and lintels shall be bull nosed. Interior corners shall be square. The base course shall be set accurately for vinyl tile, cement or other floor finish as indicated on the plans. Miters shall be furnished as required. Double faced walls or partitions greater than 4" nominal thickness shall be built of two single faced units bonded. Double face nominal 4" partitions may be constructed either with 2" soaps back to back, or single 4" units in the 6-T series.

Units less than 12" nominal length shall be obtained wherever possible from the manufacturer. Any cutting required at the job shall be performed with a power driver saw in such manner as to provide true and even edges.

All units and shapes shall be laid true to line and with courses level. All joints shall be compactly tooled slightly concave. The design of units shall conform to modular layout with approximate joint thickness of 1/4" for the nominal dimensions given for face size.

Cores may run vertically or horizontally except for lintels which shall be suitable for concrete fill, reinforced as shown on the drawings.

All electric conduit, electric cable, outlet boxes, gas lines, water lines, openings for heating and fan ducts, door frames, anchorages for doors and equipment shall be in place either prior to or during the construction of structural tile facings and partitions. No cutting of tile will be permitted after construction of the facing or partition, except upon specific permission and approval of methods by the Engineer. Lintels shall be precast and allowed to attain their full working strength as required for reinforced concrete before placing in the wall. Facings on the interior of the outside walls shall be constructed with the main body of the wall and suitably tied by means of headers or wall ties. Proper bond to the brick wall shall be made at least at every third course of tile.

The bottom course of tile shall be unglazed where floor tile cove trim is used, except where 3" concrete curbs are provided between the bottom tile course and the floor slab. In this case, the bottom tile course shall be glazed. Furnish glazed cove base tile for use with ceramic and stone flooring.

As the work progresses tile surfaces shall be cleaned with burlap. At the completion of the work they shall be scrubbed with brush and water. No acid or metal scrapers shall be used in cleaning.

All facing tile units shall be packed in suitable cardboard paper cartons or trays for protection. The utmost care should be taken in unloading, stacking and storing facing tile on the job. Storage shall be under weatherproof cover. The units shall not be removed from cartons or trays until they are placed on the scaffold for installation in the work by the masons.

7.08 Floor Coverings: Floor coverings shall be provided for floors in buildings in accordance with the following:

(a) Vinyl Plastic Tile: Provide vinyl plastic tile floor coverings of

1/8 inch gauge, laid in 9 inch squares, with border and top-set cove base at walls. Provide heavy aluminum metal binding strip or threshold at discontinuous edges. Tile shall be "Custom Corlon" as manufactured by the Armstrong Cork Company or approved equal. Protect tile covering during construction work, then clean and give two coats of wax.

Vinyl plastic tile shall be used in the office and laboratory of the Chemical and Control Building and colors shall be as approved to conform with color schedule. Furnish and install vinyl tile cove base for all concrete floors.

(b) Mosaic Tile: Floor in the shower and toilet room of the Filter Building shall be ceramic mosaic unglazed clay tile conforming to specifications of the Tile Council of America. Tile shall be laid in random pattern with 3/4" to 2" squares and oblong combinations, color to be selected. Thickness shall be 1/4". Lay in standard cement bed 1-3/4" thick over rough slab in accordance with specifications of the Tile Council.

(c) Quarry Tile shall be 6" x 6" x 3/4" ceramic clay tile conforming to specifications of the Tile Council of America. The tile shall be furnished in a shade of red with a minimum of variation in the pattern. Three samples showing the extreme variations in color shall be submitted for approval by the Engineer and for storing at the site of the work. The tile shall be laid in a mortar bed with a nominal thickness of 3/4". Installation shall be in accordance with the best current practice and conventional cement mortar method described in the "Tile Handbook" by Don Graf. Provide cove and round top trim around equipment bases. Joint lines between tile shall extend without deviation across removable floor slabs. Tile shall be cut as necessary to preserve these lines and provide a uniform laying pattern. Quarry tile shall be laid on floors in accordance with the schedule shown on the drawings.

(d) Cement Floor Finish and floor hardener shall conform to specifications under Section No. 4.

7.09 Skylights: Skylights as manufactured by Naturalite, Inc., or approved equal shall be furnished and installed. Sizes shall be as shown on the plans. Continuous plastic skydomes shall consist of prefabricated sections consisting of a reflective acrylic dome, extruded aluminum "T" frames with integral condensation and weepage gutters, preformed extruded aluminum intermediate supports and extruded aluminum retaining frame suitable for mounting as shown.

7.10 Ceilings: Furnish and install suspended ceilings for the laboratory, control room, chemical feed room, and toilets where shown on the drawings. For the lab, control and feed rooms the ceilings shall be perforated aluminum with white enamel finish, removable in panels. For shower rooms and toilets the ceilings shall be Keen's cement plaster applied to metal lath. Secure hanger rods to concrete ceilings with expansion bolts, Phillips Red Head or equal. Provide apprppriate clips, clamps, etc. for attaching hanger rods to "T" bars.

Ceilings details shall be as follows:

(a) The aluminum panel ceiling shall consist of removable flush aluminum

panels, complete with all suspension member and sound absorption pads equivalent to "Acousti-Metal" as manufactured by National Gypsum Company, or equal. The ceilings shall be snapped onto tee bars suspended from 1-1/2" channels at 4-foot centers. Channel hangers shall be 1/4" diameter rods threaded both ends. Aluminum panels shall be 12" x 24" except for 12" x 12" sections necessary to make up ceilings in odd dimensioned rooms. The panels shall have a white enamel finish. Sound absorption pads above the panel shall be of mineral enclosed in flame proof paper envelopes. A metal grid shall be provided between the aluminum pan and sound absorption pad to provide clearance. An aluminum moulding shall be provided at the junction with walls. Aluminum sections suitable to the Engineer shall be provided to allow panels to fit in ceiling sections which are not in even dimensions. Provide framing and supports for recessed fluorescent fixtures by the use of double tee bars. A layout shall be made in accordance with the manufacturer's recommendations and submitted for approval with complete details of fluorescent fixture supports. Panels shall be removable and shall be cleaned of all soil marks upon completion of erection, using materials supplied by the manufacturer.

(b) Keene's cement plaster ceilings shall be applied to metal lath supported by a metal suspension system. Metal lath shall be equivalent to Gold Bond "Small Diamond Mesh Lath" weighing 3.4 pounds per square foot. Use 3" widths of reinforcing at interior corners between ceilings and walls equivalent to "Safe-Edge Concrete". Plaster shall be applied in three coats to a thickness of approximately 3/4". Scratch and brown coats shall be equal to Gold Bond "Gypsolite Regular". Allow scratch coat to set; then apply brown coat screeded to a true surface by the use of grounds and left rough. Finish coat shall consist of 100 pounds of Keene's cement (regular) to 50 pounds of dry hydrated finish lime. This coat shall be bonded thoroughly with the brown coat, laid on well, doubled back and filled out to a true even surface. Finish coat shall be 1/16 to 1/8". Keene's cement shall conform to A.S.T.M. C61-50.

7.11 Aluminum Windows: Windows for all buildings shall have frame members and ventilator section made of 63S-T6 aluminum and given a satin aluminum finish. Frame members shall be at least 2-1/2" deep by 1-1/8" thick. Awning vent members shall be 1-3/32" deep.

All sections shall be one piece with joints mortised, tenoned and riveted. Frames shall be braced with fixed meeting rails between vents.

All vents shall be equipped with non-ferrous sliding members and aluminum alloy balancing arms with "Alclad" finish. Sliding members shall operate on tracks of stainless steel. Make provision for adjustment of all ventilators and for locking awning vents by push button automatic spring catch enclosed in the bottom section. All bolts, nuts and hinge pins shall be made of Monel stainless steel and aluminum. Provide neoprene weather stripping for entire perimeter of vents.

Windows shall be equivalent to Brown and Grist Type W windows or other approved custom made type. Minor variations are permissable except that no deviation on provisions for frame reinforcing from jamb to jamb at meeting rails or depth of frame and ventilator members will be acceptable. Awning vents shall be used for windows.

Screens shall be provided for all windows. These screens shall be made of aluminum insect screen wire 18 x 14 mesh, .0113 gauge, attached to re-wirable rolled aluminum frames and furnished by the window manufacturer. The upper screens shall be fixed and the lower screens shall be sliding.

Provide aluminum channel glazing beads for the bottom pane of each ventilator. All multiple windows shall have mullion covers inside and outside. Care shall be taken during installation that windows are set freely without binding, twisting or warping. Wherever aluminum shall come in contact with steel, steel shall be painted with one coat of bituminous asphalt paint prior to the window installation. Window frames shall be wiped with an oily rag before installation to facilitate removal of cement or other particles which may be deposited during construction.

7.12 Glazing and Caulking: All glass for windows shall be of sizes called for on the approved sash details. Glass for windows shall be "Diffusex" double strength "B" glass as manufactured by Libby-Owens-Ford Glass Company, or approved equal, except as follows:

(a) "Diffusex" with both faces frosted shall be used in windows of shower and toilet room doors.

(b) Windows in the South and East walls of the building shall be clear, tined "A" quality double strength glass; those in the North and West walls shall have clear double strength "A" quality glass in one center light of sash having an odd number of lights in width, and two lights in sash having an even number of lights in width. The clear lights shall be the panes whose center is nearest to 5'-3" above the floor level.

Glass for doors shall be 1/4" diamond mesh wire glass, "A" quality, as specified above, and clear or obscure as shown on the drawings.

All glass shall be carefully selected, shall be bedded and face glazed and left clean, sound and free of visible cutting imperfections upon completion of the work. Each light shall bear the identifying label of the manufacturer. In glaxing sash, care shall be taken not to bow the bottom of the ventilator. In the event it is bowed during glazing, it shall be pressed back into line before the putty hardens. Glazing beads furnished by the sash manufacturer shall be used for the lower vented pane of all windows. For installation of the glazing beads, bed the glass in compound, press the beads in place, apply screws and wipe away excess compound.

(c) Glazing compounds shall be one of the following:

1.	Dicks-Pontius Co.	No. 1012
2.	Armstrong Company	Arm Glaze Type "G"
3.	Concord Paint Co.	Con-Glaze Type "C"
4.	Plastic Products Co.	Plastic-Glaze Type "C"
5.	Tremco Mfg. Co.	Tremglaze

Set window and door frames with 1/8 inch joint for caulking all sides. Caulking compound for use between frames and masonry shall not completely harden with age and shall be applied with a caulking gun in a workmanlike manner.

Apply a priming coat of paint over all finished putty and caulking work as soon as possible after completion.

(d) Interior and exterior plate glass shall be 1/4 inch polished plate.

7.13 Doors: Complete shop drawings shall be furnished by the manufacturer of doors, frames and trim for approval by the Engineers before fabrication or shipment.

(a) Hollow Metal Doors: Furnish and install hollow metal swing doors with combination frames as noted on the drawings, equivalent to those manufactured by Richmond Fireproof Door Company, Aetna Steel Products, Niedringhams Metal Products, or approved equal.

Combination frames shall be of the best quality, full cold rolled furniture steel, not less than 14 U. S. Standard gauge. All angles, molding, returns and miters shall be neatly welded and ground smooth. Frames shall be provided with at least two adjustable slip anchors, 16 gauge for each five feet in height and one additional anchor for each extra 2'-6" in height. Frames shall extend at least to the rough floor but not less than 1" below finish floor. They shall be protected during shipment by a removable steel spreader at the bottom of the frame. Frames shall be mortised, drilled and tapped, using 11 gauge reinforcing for template hardware as specified herein. Provide 26 gauge covers to protect tapped holes. Reinforcing for surface applied items shall be 14 gauge. Profile of frames and trim shall correspond to details shown on the drawings.

Hollow metal doors shall be manufactured of stretcher levelled sheet steel, of stile and panel construction as indicated on the drawings, assembled with all corners mitered and welded and ground smooth. Stiles and rails shall be not less than 16 U. S. Standard gauge and filled with sound-deadening material. Stiles and top rail shall be 5-1/2". Bottom rails shall be 8". Lock rails shall be 4-1/2". Panels shall be constructed of two 18 gauge sheets, separated by 1-1/4" of insulated materials. Doors shall be 1-3/4" thick. Panels shown on the drawings shall be held in place with moldings or shape of at least 20 gauge steel. Doors shall be mortised and reinforced for hardware in the same manner as specified for frames. Provide moulded astragals for exterior doors in pairs. Provide drip moulds for all exterior doors.

All doors and frames shall be thoroughly cleaned of oil, grease, rust and other impurities at the factory and given two priming coats, baked on separately. The first coat shall be a zinc chromate, rust inhibitive primer. The second coat shall be a combination filler and primer suitable for field finishing. Frames of structural channels shall first have all mill scale and rust removed by sandblasting and then given the same finish prescribed for hollow metal doors and frames. Frames shall be finished both inside and out. The shop painting shall be of such quality that no rust shall be apparent through the finish at any time prior to field painting. If rust does appear, the Contractor will be required to remove the factory prime coats which are defective, clean the steel as directed by the Engineer and have new finish applied as specified originally in a manner suitable for proper field painting.

(b) Roll-Up Door, Guide and Hardware: Galvanized and primed steel roll-up service door, Type FC, as manufactured by Cookson or similar and equal

items as made by Mahan or Kinnear. Provide weatherstripped guides, bottom astragal, #4-20 gauge slats, top hood, interior MU-W electric operator, and all other parts required for a complete installation. Submit complete shop drawings for approval prior to fabrication.

7.14 Front Entrance Door and Side Lights: The main entrance door and window assembly for the Filter Building shall be Prescolite 7012, single door, 3'-0" x 7'-10" with window section, overall width 6'-0" aluminum store front door and frames. All glass shall be 1/4" polished plate; see Plans for arrangement. Frames shall be 1-3/4" wide x 4" thick. Norton surface mounted closer overhead. Standard butts, ball bearing, polished anodized aluminum 4-1/2" x 4-1/2", 3 per leaf. Door shall be weatherstripped and be furnished with pull bar and push bar. Cylinder lock shall be furnished under Hardware, Set 1. Painting and threshold are not required. See Plans for swing.

7.15 Granite: Granite shall be equal to Berkeley blue of standard grade, free from starts, cracks, or seams which may impair its structural strength, 18" square samples shall be submitted for Architect's approval from the Georgia Granite Co., Davidson Granite Co., or similar granites of other manufacturers. Granite shall be of sizes and shapes as shown on the drawings; all exposed surfaces shall be smooth polished finish. Where designs are indicated at spandrels they shall be sand blasted. All surfaces at joints between stones shall have a tolerance of not more than 1/16" with true line.

7.16 Hardware for Hollow Metal Doors:

(a) Provide template type, hardware for all hollow metal swing doors. The catalog numbers used in the hardware schedule refer, in general, to the P & F Corbin Company and Stanley Works and are given for identification as to quality.

(b) Reference shall be made to the plans to determine the quantity of all items. Doors will be 1-3/4" thick. Mortises and reinforcements are to be provided by the door manufacturer.

(c) Doors in pairs to have molded astragal.

(d) Exterior doors to have drip mold.

Hardware Set - 1

3 - Pr. Butts - 291Y - AMS - 4-1/2 x 4-1/2 - US26D

1 - Locks - 7543 - PH - WBX - TMS - US26D MK

2 - Flush Bolts - 2846-12" AMS-US26D

1 - Dust Proof Strike - 70 - US26D

Hardware Set - 1
(Continued)

1 - Closer - 500 MS-4-11-SBL-AMS

1 - Stop - 0359-1/2 R

1 - Stop - 0359-1/2 L

Hardware Set - 2

1-1/2 - Pr. Butts - 291Y - AMS - 4-1/2 x 4-1/2 - US26D

1 - Lock - 7551 - PH-WBX-TMS-US26D-MK

1 - Closer - 500 MS-3-11-SBL-AMS

1 - Stop - 0359-1/2 L - US26D

3 - Silencers - 33

Hardware Set - 3

1-1/2 - Pr. Butts - 291Y - AMS - 4-1/2 x 4-1/2 - US26D

1 - Lock - 7537-PH-WBX-TMS-US26D-MK

1 - Stop - 0359-1/2 R - US26D

3 - Silencers - 33

Locks shall be 700-7500 Series, wrought design with auto-friction latch bolt, 2-3/4" backset, case size 5-3/4 x 4 x 7/8, US26D - Dull Chrome.

Closers shall be 400 Mortise Series, semi-concealed.

Stops shall be 0359-12, 359-12, and 383-12, where applicable, brass, dull chrome plated.

Quantities of each hardware item shall follow approved hardware application practices for the type of door, traffic and use, for each door as determined by the Engineer. Refer to drawings for door swing and key location where locks are used. All doors shall be keyed alike except the office and laboratory doors. Furnish one key for each lock keyed alike, four keys for the office and laboratory locks.

7.17 Thresholds: Furnish thresholds as shown on the plans for all exterior doors and interior doors as specified above.

7.18 Subway Grating: All subway grating shall be of the type and depth as shown on plans. Provide bearing angles anchored in concrete. Cuts around piping and other openings shall be banded. Layouts must be made from approved piping and valve plans as required herein. Provide suitable anchors for all grating supported on structural steel and elsewhere. Inside grating shall be galvanized steel, outside grating shall be aluminum, as specified under Sections 5.07 and 5.08.

7.19 Concrete Treads: Nosings of all concrete steps, interior and exterior, shall be provided with 3-inch Feralun type treads, anchored, unless provided with a separate stair covering.

7.20 Shower Room: Steel lockers shall be single tier 15" x 18" x 72", flat top, padlock hasp and latch, 16-gauge doors and frame, 24-gauge body, full length louvers. Install on concrete base 4-inches high with ceramic tile cove.

7.21 Laboratory and Office Furniture: The Contractor for Division One shall furnish and install all laboratory and office furniture complete with all piping, all as indicated on the plans and/or specified herein. The laboratory shall be furnished as manufactured by Kewanee Manufacturer or approved equal. It is the intent of this Specification to require the installation of first-class equipment throughout and to call for standard base units except where special work is specified. Identification numbers listed herein are taken from Kewanee Mfg. Co.'s catalog, however, types of equal make will be acceptable on basis of approved equipment base type units.

Materials shall conform to the following:

(a) Steel: Cold rolled prime grade, levelled and squared.

(b) Stainless Steel: 8% nickel, 18% chromium, A.S.I. Specifications.

(c) Sheet Lead: Six pound chemically pure, virgin lead.

(d) Alberene Stone: First grade natural Virginia Alberene stone.

(e) "Kemdur": Made of asbestos fibers and portland cement bonded together with corrosion and moisture-resistant resins and then treated with a clear surface impregnate, specially prepared for high resistance to acids, alkali and solvents.

(f) Glass: "A" quality clear glass, double strength for height under 48", 3/16" for height over 48".

All units shall be pre-fabricated sectional type of heavy cold rolled steel with all steel and component parts protected by "bonderizing" and a three-coat rust inhibitive baked-on enamel or plastic finish which is highly resistant to acids, alkali and solvents. All parts shall be interlocked, spot welded and arc welded for maximum rigidity.

Cabinet units in general shall be 37" high plus an 8" high service tunnel and 30" from front to back. Curb and top of service tunnel shall be constructed of 1-1/4" thick "Colorlab". Tops shall be as long as practical. Where joints occur provide non-ferrous splines for assembly. Joints shall be finished with acid-proof cement. All holes for fixtures, cutouts, grooving and edge rounding shall be done during fabrication. Provide filler panels for end closures.

(a) Construction: Each metal laboratory unit shall be fabricated as a complete integral case, die-formed into the structural members hereinafter described so as to fit harmoniously into any assembly of cabinets making up the table and to allow relocation at any subsequent time. Where several sectional cabinet units are placed side by side, they shall be securely joined together with concealed bolts in order to insure rigidity.

(1) Fabrication and Jointing: The fronts of cabinets shall be of smooth flush construction with no sharp edges where vertical and horizontal members meet. At joints and intersections, the parts shall not be only electrically spot-welded, but in addition shall

also be notched, keyed, offset, and tightly fitted to form rigid mechanical interlocking joint construction. All spot-welding shall be of the offset lap type.

(2) Structural Members: All top rails, bottom rails, intermediate rails, uprights and intermediate uprights shall be formed from No. 16 gauge steel. The exposed fascia of intermediate rails shall be 3/4-inches wide, and the top and bottom rails 1-inch wide. All sectional units shall have No. 12 gauge steel gusset plates installed at each corner at both tops and bottoms of units. Gusset plates at the bottom of units shall be provided with leveling device.

(3) Doors: Doors on all sectional units shall consist of an outer pan of #18 gauge steel and an inner pan of #20 gauge steel formed into box shape with the inner door telescoping into the outer doors and both members rigidly held together by welding. All door openings shall be rabbeted at the top and two sides. Where hinged doors are called for, uprights as well as doors, shall be slotted to receive hinge. All hinges to be reinforced and backed up by #14 gauge full height offset strips spotwelded to inside of doors and uprights.

(4) Drawers: Drawers shall operate on a pair of ball-bearing channel suspensions. Case channels to be easily removable and drawer channels are to be riveted to the drawer after drawer is painted. Provide drawer stops designed so as to prevent the inadvertent removal of drawer and at the same time permit drawer to be easily removed. All drawer openings shall be rabbeted at the top; strikes shall be provided at top and sides.

(5) Shelves: Adjustable shelves shall be of one-piece construction and shall have ends and back flanged down 1/2". The front edge shall be flanged 1/2" then back 1/2". Shelves shall be reinforced by a channel welded to the underside of the shelf. Adjustable shelves shall be adjustable on 17/32" centers and shall be supported on metal shelf clips engaging in enclosed perforations through the formed-up corner posts at the front and back. The use of attached shelf standard or other devices which shall interfere with the ready justing and cleansing of the cupboard interior is not desired and will not be acceptable.

(6) Laboratory Counter Top: The counter top for the laboratory shall be first grade natural Virginia Alberine stone.

(7) Backs: Backs of all sectional cabinet units shall be #18 gauge steel and made removable for access to piping.

(8) Bottoms: Cupboard bottoms shall be removable and constructed of Masonite or other acid-resistant material.

(9) Bases: Bases shall be integral with cases and shall be provided with rectangular recessed toe spaces along working sides of all equipment having case work at floor. Base members shall be constructed of #16 gauge steel.

(10) Storage Cabinets: Storage cabinets and cases shall be 18 gauge.

Shelves shall be adjustable on 1/2" centers. Counter tops shall be the same as for cabinet units unless otherwise stated. Stiles and rails for glass doors shall be double wall construction with neoprene gaskets for glass panels. Sliding doors shall operate on ball bearing sheaves running on stainless steel tracks.

(11) Sinks: Sinks shall be one-piece epoxy resin units equivalent to "Kemresin".

(12) Hardware: Hardware for handles and pulls shall be solid cast aluminum drop forged with anodized satin finish. Hinges shall be 14 gauge steel, cadmium plated, bronze pines, semi-concealed type.

(13) Molding: Provide black rubber base molding for all exposed fronts and sides of floor type units, also black rubber leg shoes for table type units.

(14) Electrical and Plumbing: Flush mounted electrical receptacles with knockout boxes shall be provided on the face of the service tunnel, one two-gang, 15 amp, 125 volt, 3 wire, grounding type and one single gang, 20 amp, 250 volt, 3 wire polarized (one wire grounded), for each drawer and/or cabinet unit.

Provide hot and cold goose-neck fixtures, lead sink strainer, overflow stopper and trap for tub sinks.

Provide one gas cock on the face of the service tunnel of each drawer and/or cabinet unit.

(15) Fume Hood: The fume hood shall be supplied with flush mounted duplex electric receptacle, pedestal gas cock, remote control valve, cold water goose-neck fixture, 3" x 6" lead oval bowl and a 36" long fluorescent light fixture and switch. A fume hood exhaust fan and duct work shall be concealed in an enclosure above the fume hood chamber.

A fume hood blower consisting of a direct connected cast iron blower with steel impeller shall be furnished and installed in the fume hood. The blower shall have a capacity of 500 cfm at 1/4 inch static pressure and be powered by a 1/6 H.P., 120 volt, single phase, 60 cycle, 1200 rpm motor. Minimum duct size shall be 10-inch in diameter. All ducts shall be constructed of 14 gauge aluminum.

(16) Leveling Devices: Leveling devices shall consist of heavy screw machine thread engaging a die-cast, non-ferrous fitting securely fastened to bottom gusset plates and capable of adjustment of not less than 1-1/2" in height.

(b) Finish: After the units have been welded together, they are to be submerged in a degreasing bath and then wiped clean to remove all grease, dirt and foreign matter. After thoroughly cleaning, the units are to be immersed in a bath to give all surfaces and edges a complete non-metallic phosphate coating. No regular grade steel finish or lead-coated steel is acceptable. All metal parts shall be finished with at least two coats of high grade, acid-resisting based enamel; color to be selected.

7.22 Laboratory and Office Units: The following units are required:

(a) Chemical Laboratory:

2 - Stools:	Model TPC-K, 15" to 20" Extension.
1 - Dishwasher:	Under counter, white 24" wide, 1,000 watt heater, 115 volts Frigidaire Model #DW-DUF, or equal.
1 - Incubator:	20° C, 115 V. adjustable from 0° to 25° C., A. H. Thomas #1470-A.

Other furniture items are required as shown by number on the drawings.

(b) Biological Laboratory:

2 - Stools:	Model TPC-K, 15" to 20" extension.
1 - Refrigerator:	Under counter type, 5 cu. ft.
1 - Range and Oven:	21-inch apartment style, 208 volts, white, Frigidaire Model #RAH-4, or equal.
1 - Autoclave:	Horizontal, Trenner electric, 3,500 watts, 115 volts with automatic control, A. H. Thomas Model #1686-R.

Other furniture items are required as shown by number on the drawings.

(c) Office:

1 - Desk:	Steelcase 149041, with laminated plastic top, #2621 walnut.
1 - Swivell Chair:	Steelcase #C-181.
1 - Side Chair:	Steelcase #1133
2 - File Cabinets:	Same as Chemical Laboratory.
1 - Waste Basket:	Steelcase #21.

7.23 Plastering: Work under this contract includes furnishing all materials and performing all labor required for placing plaster in areas shown on the drawings.

(a) Preparation: All exterior walls to be plastered shall be prepared for plastering by wire brushing and the application of one coat bituminous sealer. The bituminous sealer shall be of Inertol manufacturer, #7 black. The sealer shall be thoroughly brushed into the brickwork, and applied at the rate of not less than 250 square feet per gallon. Particular care shall be given to the application of the sealer where wall face

joins roof and around all openings. The sealer shall be allowed to dry at least 24 hours before the application of any plaster.

(b) Lath: Upon completion of sealer application the entire wall surfaces, window and door jambs, sills and heads shall be covered with galvanized diamond mesh steel lath properly secured to the main wall and to all other surfaces to be plastered.

(c) Plastering: Plaster shall be applied in three coats in accordance with the following: Scratch coat shall be composed of one part Portland cement, three parts sand, 15% lime putty, plus 15 lbs. of fiber per cubic yard; brown coat to be mixed same as scratch coat except 7-1/2 lbs. of fiber per cubic yard; finish coat to be one part white Portlant cement to two parts sand, plus 20% lime putty. Application of plaster shall be in accordance with the following: The scratch coat shall be positioned firmly against lath so as to obtain good keying and bonding, and the surface shall be scraped to provide surface for the brown coat. Scratch coat shall be firm and hard before application of brown coat. The brown coat shall be applied, rodded and floated, to a true even finish. When the brown coat is firm and hard it shall be dampened by a light sprinkling of water. The finish coat shall then be applied and shall be floated to an even fine sand texture. Plastering work shall not be done except by the best of skilled plasterers.

(d) Protection of the Work: All walls and work shall be carefully covered, boxed and protected during bad weather, and suitable boxing shall be placed where work is liable to injury in the manner described by the Engineer. Any damage or unsatisfactory work shall be replaced by the Contractor at his own expense.

(e) Built-In Items: All cutting and fitting to make connections with classes of work shall be done. All wall plates, columns, beams, lintels, wall flashing, sleeves and other such work shall be carefully built in, as well as all electric conduit, wooden grounds or other materials, equipment and fixtures as may be required.

7.24 Stucco and Cement Plaster: Stucco and cement plaster shall be furnished and applied in accordance with the following requirements.

(a) Materials: All cements, gray and white Portland, shall conform to the current standard specifications of the American Society for Testing Materials and as manufactured by Signal Mountain Portland Cement Co., Chattanooga, Tennessee or approved equal. Trinity white cement shall have waterproofing mixed in at the factory.

(b) Sand shall be clean, well graded, screening from crushed stone or slag and shall conform to the current A.S.T.M. Specifications for concrete sand, except that it shall all pass the No. 4 sieve and have not more than 5% passing the No. 100 sieve.

(c) Water shall be clean and fit to drink.

(d) Mixing: Mortar for all coats shall be mixed in proportions of one volume of cement to approximately three volumes of aggregate. An approved

plasterizing material, not to exceed 1/4 the volume of cement, may be used if necessary. Mix all ingredients thoroughly before adding water. All measurements shall be accurate and proportioned exactly alike.

(e) Application: All surfaces except metal lath to receive stucco and cement plaster shall be thoroughly and evenly wetted (not saturated). Stucco shall be applied in three coats, the first coat being thoroughly forced tightly into interstices and pores of masonry. The scratch and brown coats shall be approximately 3/8" thick and should be scored to provide bond for the succeeding coat. Over the brown coat apply 1/4" thick finish coat of white Portland cement, finishing in a true and even plane.

(f) Curing: Stucco and plaster work shall be kept continuously moist for a period of not less than three weeks for curing purposes and should an unusual hot dry period be encountered, this wetting shall continue until such period in the opinion of the Engineer has been corrected.

(g) Guarantee: This Contractor shall guarantee all work included under this section for a period of one year after completion of the job against all defects and/or faulty materials of workmanship and he shall make good any such defects occurring during that period at no expense to the Owner.

7.25 Glass Block Windows: Glass block windows shall be installed as indicated on the drawings. Glass block shall be 7-3/4" square similar to "Argus" pattern manufactured by the Pittsburgh Glass Company.

(a) Installation: The entire perimeter of the opening shall be mopped with heavy coating asphalt emulsion prior to setting. Glass blocks shall be set in accordance with the specifications of the manufacturer with expansion joint strips. Oakum packing, fillers, wall tiles, anchors, caulking and appurtenances necessary for the complete installation. Mortar shall be as specified for brickwork.

7.26 Payment: No separate payment will be made for work under this Specification, except as may be specifically set forth in the Proposal. The cost of such work and all cost incidental thereto, except such work as may be specifically set forth in the Proposal, shall be included in the price bid for the item to which the work pertains.

7.27 Plumbing, Heating and Ventilating: Scope of the work under this section of Specifications shall include furnishing and installing all piping and all equipment specified herein for plumbing fixtures, fixture fittings, lines for hot and cold water supply, building heating, waste, drain and vent lines as herein provided or shown on the plan. Lines included shall be all those required for the complete installation. Water piping, gas piping, valves, fittings, etc., shall be as specified under Section No. . All exposed parts of metal fixtures and fittings are to be of "Chromard" finish brass. Refer to drawings for correct quantities of fixtures. Water supply lines, 2-inch and under, shall be copper, as specified. Necessary blockouts shall be made and embedded items required for installation of plumbing, heating and ventilating shall be provided and installed.

(a) Traps: Each fixture, floor drain, and piece of equipment requiring connection to the drainage system shall be separately trapped.

(b) Floor and Area Drains: Area drains and floor drains indicated in concrete floors laid on earth shall be Series V-130, 4-inch with strainers and trap. Floor drains in connection with self-supporting concrete floors shall be Series 510, with trap. Provide a 2 lb. (to the square foot) lead flashing 18" square securely clamped to drain. Shower drains shall be Series 300-C. All Series numbers shown above refer to Josam Manufacturing Company, Michigan City, Indiana.

(c) Pressure Reducing Valves: Pressure reducing valves on water service lines shall be Mueller H-9000, with strainer, or approved equal. Pressure reducing valves at other locations shall be as called for on drawings or as required for operation of all equipment.

(d) Drinking Fountain: Provide an electric water cooler (5 year warranty) in the Control Building with bonderized steel cabinet, stainless steel receptor, water pressure regulator, five gallon/hour capacity, foot operated valve, G. S. Cat. No. RSA6E3 or equal, additional remote stainless steel accessory fountain, G. G. Cat. No. A1521, or equal.

(e) Shower Room Accessories: Equip the toilet room with accessories equivalent to Miami-Carey type listed below.

Mirror - No. WE-1418B, 14" x 18" glass, with glass shelf and towel bar, two required.

Towel Hook - No. 4008, at mirror.

Double Robe Hook - No. 4019, one required.

Towel Bars - 18" long, No. 4054, one required.

Also, provide approved wall mounted paper towel dispenser and waste basket 14" x 30". Dispenser shall be of a type suited for refilling.

7.28 Piping for Equipment in Buildings:

(a) Completely dimensioned layouts shall be furnished by the Contractor for all piping fittings, valves, specialties and the equipment purchased.

(b) Openings: Openings in floors, walls and all other parts of buildings shall be made accurately from the layouts.

(c) Grating Floors: Subway grating floors shall be fabricated from these layouts and all cutouts shall be banded.

(d) Support: All piping and appurtenances shall be properly supported by a system of I-Beams, hangers, pipe stand, saddles, base ells and concrete piers as required. Concrete inserts, bolts, anchors, etc., shall be placed in the forms before pouring concrete.

7.29 Water Lines: Include water lines to all fixtures, equipment or other appurtenances which require water and elsewhere as shown or indicated on the drawings.

7.30 Waste and Vent Lines: Include all waste, drain, soil and vent lines from fixtures, equipment and floor drains.

7.31 Sheet Metal Duct Work: All sheet metal ducts shall be fabricated Alclad Building Sheet Aluminum, 303-H14.

All duct work for ventilation, heating and/or air conditioning in interior of buildings and in dry pits shall be not less than the minimum thicknesses for various sizes of duct work shown in the following table. Ducts shall be round or square as indicated on the plans.

Rectangular		Round	
Size	Min. Thickness	Size	Min. Thickness
To 12"	0.020"	To 12"	0.016"
13" to 30"	0.025"	13" to 24"	0.020"
30" to 40"	0.032"	25" to 36"	0.025"

All sheet metal and duct work for a complete and operative system shall be provided including offsets, elbows, transformations, dampers, deflectors, grilles, registers, hangers and all related accessories necessary, whether or not shown on the plans.

Duct work exposed in finished area shall be constructed with drive slip joints. Duct work concealed or in unfinished areas shall be constructed with pocket or bar slip joints.

Plan panels of duct over twelve (12") inches wide shall be cross broken.

The entire installation shall be rigid, and duct work shall be free from rattles and air noises when in operation.

Elbows shall be made with an inside radius equal to the width of the duct except where otherwise shown or necessitated by unavoidable space conditions. Where inside radius is less than three-fourths (3/4) the duct width, multiple turning vanes shall be provided. Square elbows shall not be used.

Transformation shall be made with a slope of one to seven (1:7) where space conditions permit.

Horizontal duct hangers shall be one-eighth inch by one inch (1/8" x 1") bands on ducts eighteen inches greatest dimensions or smaller, and three-sixteenths inch by one and one-half inch (3/16" x 1-1/2") on ducts of above eighteen inch (18") greatest dimension, trimmed flush with bottom of the duct, located not more than 8'-0" O.C.

Where ducts are suspended directly from the building structure, hangers shall be riveted to the duct and secured to the structure by bolts and inserts, lag bolts or expansion shield bolts not over eight feet on centers (8'-0" O.C.).

Where ducts terminate at concrete ceiling-roof slab provide 1-1/2-inch angle collar flange for bolting or ceiling, used gasket for air tightness.

All duct joints shall be tight and free from air leaks. At all junctions with dissimilar metal provide suitable insulating material.

Duct connections to the outlets of cabinet fans shall be made with woven asbestos or "Ventglas" collars not less than 2-inches long. Asbestos shall be

Johns-Manville Style MP-3010, and shall be secured to the duct and fan connections by straps holding the asbestos in formed channels. Provide a braided copper bridge strap across flexible connections.

Six (6) sets of drawings covering sheet metal duct work shall be furnished and approved prior to any duct work being fabricated.

7.32 Ventilating Equipment: Ventilating equipment shall be of the type and sizes indicated on the drawings and shown in the schedule hereinafter. Bases suitable for mounting ventilating equipment shall be provided as indicated on the drawings.

Ventilating equipment shall be equivalent to that manufactured by ILG types L-CPF-IQ, or BC and shall have the capacities at 1/4-inch static pressure as given in the tabulation. Capacities at 1/2 inch static pressure shall be equal to tabulated values published by ILG.

Fans shall be driven by direct connected motor, self-cooled, and so sealed that no fumes can contact the motor or motor frame and shall be non-overloading. Motors shall be for 120 volt, single phase or 208 volt, three phase, 60 cycle, capacitor type, without centrifugal switch for fans 1/4 H.P. or more, except as noted. For smaller sizes, motors may be shaded pole type.

Roof fans shall have housings of aluminum, fully weatherproof, easily removable and fitted with bird screens. Gravity type aluminum shutters shall be provided in the fan base.

Propeller and centrifugal fans shall be furnished with wall mounted gravity type aluminum shutters and shall be of the size indicated on the drawings.

Air intakes shall be equivalent to those manufactured by ILG, Types ABV or IWQ as shown on the drawings, and shall have capacities equal or greater than fan being served, including system losses. The intake shall consist of aluminum housing and louvers with motor operators and equipped with removable bird and insect screens.

All Accessory Equipment: Air intakes, gravity shutters, insect and bird screens, electrical controls including control and disconnect switches, thermostats, and all other accessories shown or noted on the drawings shall be furnished by the manufacturer of the ventilating equipment. All electrical accessories shall meet the requirements of the section under these Specifications covering electrial equipment and work.

7:33 Unit Heaters: Furnish and install where shown on the plans, unit heaters as manufactured by ILG, or approved equal. Units shall be suspended by rods from the ceiling or wall mounted with air return below heater. Heaters shall be automatically controlled by thermostat with manual by-pass.

All Accessory Equipment: Electrical controls, including contral and disconnect switches, motor circuit transformers, thermostats, and all other accessories shown or noted on the drawings shall be furnished by the manufacturer of the heating equipment. All electrical accessories shall meet the requirements of the section under these Specifications covering electrial equipment and work.

7.34 Cranes and Hoists: Furnish and install where specified below and as shown on the drawings crane and hoists complete with crane tracks or runways,

rail-beams, anchor bolts, electrification (if required) and all other appurtenances necessary. Crane and hoists shall be as manufactured by the Wright Hoist Division of the American Chain and Cable Company, Inc., or approved equal. Anchor bolts for all tracks, runways or rail-beams shall be accurately set in the concrete roof beam forms prior to pouring any concrete.

Location	Description
Pump Station	- One, 7-1/2 ton single beam, underhung, hand operated B-36 crane with WHEL 3ZT15M speedway electric 2-speed, 7-1/2 ton hoist and motorized trolley.

(a) Crane: The crane shall be 7.5 ton capacity, single beam (18 @ 54.7 lbs. min.), underhung, motor operated, Wright B-36. Service conditions shall be for NEMA Standard, Class I, Stand-By Service.

(1) General: Cranes shall be built to operate on specified level runways held to nominal span within plus or minus 1/8" tolerance. The runways shall be straight and level within 1/2° horizontal variation and within span tolerance limits.

The cranes shall be designed with a minimum safety factor of 5 to 1 in relation to the ultimate strength of the materials and a minimum resistance to permanent deformation of any of its parts of 3 to 1 in relation to the yield point of the materials, whichever of the two conditions will set the minimum.

(2) Girders: Bridge beams shall be designed and built following general rules of American Institute of Steel Construction, and under full load the deflection shall not exceed 1/1000 of the span. Bridge beams shall be select structural steel members and they shall provide level and straight runway tread surfaces for the hoist supporting trolleys.

(3) Crane Trucks: Crane end trucks shall be built of ductile structural shapes and welded into a stable assembly of sufficient strength to comply with general strength requirements previously specified, and in addition, to provide proper wheel and bearing alignment for crane wheels and drives during life of crane.

End truck wheel base shall be 1/8 of crane span minimum.

End trucks shall be designed to run on the lower flanges of U. S. Standard beams. Each end truck shall be equipped with two driven, co-axial and two plan co-axial and wheels. The tread surfaces of the wheels shall agree with the runway beam taper. In order to eliminate flange friction, end truck wheels shall be flangeless and guided from skewing by means of beam web rollers. The end truck frames shall be welded from structural shapes into a single unit of such strength as to prevent distortion and mismatch of gears under maximum rated load.

One wheel on each side of each truck shall be equipped with a hardened gear ring - each mating with hardened steel pinions of the squaring shaft for uniform angular travel of the wheels.

Attachment of the bridge beam to the trucks shall be by means of fitted bolts, and where necessary the bolts shall be augmented with additional support members to obtain the specified safe beam support of 5 to 1 minimum under full load.

(4) Crane Wheels: Crane wheels shall have tread surfaces hardened to 400 Brinell minimum. Each wheel shall be supported on tapered roller bearings mounted on stationary axles suitable to take radial and thrust loads. Wheel axles must have mounting nuts for bearing take-up. Wheel mounting so designed that axles and wheels can be removed without disturbing other truck elements or their alignment.

Attachment of end trucks to bridge beams shall be effected with fitted bolts in reamed holes which will insure true alignment in assembly and convenient erection.

(5) Welding: Welding of the bridge girders, end trucks and crane components shall be done by certified welders and be in accordance with rules of American Welding Society. All welds shall be ductile with a minimum of 15% elongation. They shall have a good weld penetration, free of cracks and undercuts, and the welds shall manifest workmanlike appearance.

(6) Crane Drive: Bridge drive shall be effected using a fully enclosed 30 minute duty cycle rated motor in a NEMA frame and complying with NEMA performance specifications. The motor shall be integral with a fully enclosed gear reduction unit. The motor and the gear reduction shaft shall be supported on permanently lubricated precision ball or roller bearings, and the drive shaft shall provide synchronous drive from the gear reduction to both end trucks. Integral with the crane drive and motor shall be furnished an automatic cam-actuated, solenoid, drag brake using jaw type shoes and dynamically balanced brake wheel. The drag brake shall be of the single point adjustment type.

(7) Drive Shaft: The line shaft of the crane shall be supported on lubricated precision ball or boller bearing pillow blocks spaced on 10 ft. maximum centers. All bearings in the crane wheels, those supporting the squaring shafts and the gear reduction shafts, shall be dimensioned for 15,000 hour average bearing life minimum. All wheel and shaft bearings shall be lubricated through pressure grease fittings and from an oil splash pool in the gear reduction housing.

The crane squaring shaft shall be ground and polished steel to required bearing tolerance. It shall limit torsional shaft stresses to 6,000 psi; in addition, the drive shall be so arranged and designed that the maximum torsional twist angle in the squaring shaft, when referred to the drive wheels of the crane, shall not exceed 1° of wheel travel under maximum rated load and regardless of load location.

(8) Gearing: All gears shall be cut from solid blanks with 20° pressure angle involute shape for high strength, and in the load ratings shall comply with A.G.M.A. Specifications. All gears operating at higher than 200 fpm pitch line speed shall be fully enclosed in oiltight housings and lubricated by splash principle. All gear teeth shall have ductile cores and be surface hardened to RC 40 minimum.

The gear train shall provide for a minimum service life of 4,000 hours compounded from intermittent operations and corresponding to 5 years minimum industrial use.

(9) Conductor Wiring: Collector wiring shall be 100 ampere rating minimum and shall be of the enclosed safety type conductor system, similar and equal to "Shok-Pruf" channel conductors as manufactured by the Louden Macinery Company, using two 2-conductor channels (fourth conductor connected as ground), and designed to operate the hoist in any position on the crane and with the crane in any position. All other wiring of the crane or hoist shall be in rigid or flexible conduits and in accordance with the NEC and complying with Fire Underwriters Specifications. When the crane is shipped, knocked down, the wiring shall terminate in approved terminal boxes, and wire ends shall be provided with permanent marking tags. Any bending of enclosed safety type conductors shall be done by the manufacturer prior to shipment and such bends shall accurately conform to the required configuration.

(10) Controls: Electrical controls shall be selected so that they shall limit maximum acceleration and retardation of 1 foot per second squared, and this limit excessive load swing. A mainline contactor with start and stop button shall be furnished as part of the crane.

(11) Painting: The crane and components before shipment shall be painted with a shop prime coat of paint of manufacturer as specified under Section No. 17, III, as selected by the General Contractor and approved by the Engineer. All surfaces inaccessible after assembly shall receive one prime coat and two finish coats as specified under Section No. 11, Divisions 1 and 3.

(b) Electric Hoists:

(1) Main Building Pump Room: A hoist of the close headroom type, motorized travel, shall be furnished and installed for servicing the main building pump floor and shall conform to the following:

Capacity: 7.5 tons lift, 27 feet lifting speed, 13.5/3.4 FPM beam. Size - 18154.7; hoist motor - 7.5 HP, 1,800/450 rpm, for 440 volt, 3 phase, 60 cycle, A.C. with upper limit switch. Furnish with pendant 6 button push button station, current collectors for use with two 2-conductor enclosed safety type conductors, overload cut-off device, and with time (adjustable) delay between slow and fast speeds in hoist controls.

(2) General Requirements for Hoists: This Specification covers electric wire rope hoists capable of monorail suspension and with single or multi-speed control. The capacity of the hoists shall be the rated load in tons, of 2,000 lbs. each, that the hoist will raise, maintain and lower without exceeding the design safety factor.

(3) General Characteristics: All apparatus covered by this Specification shall be constructed in a thorough and workmanlike manner. Due regard shall be given in design for safety of operation and durability of parts. The design of all units shall embody the following general characteristics.

a. The hoist shall admit wide speed changes through simple change in gearing and thus permit adaption of the unit to changing service requirements. Each hoist frame shall be suitable to be equipped with a choice of 3 standard rated motors, and thus further augment flexibility of speed and load rating after the hoist has been delivered to the user.

b. All hoist parts shall be interchangeable and manufactured to close accuracy. The hoist shall be of a balanced design and free of tendency to tip when mounted on a monorail tract if installed according to manufacturer's recommendation.

c. All parts requiring periodic adjustment or replacement shall be readily accessible and the maintenance shall require only standard tools.

(4) Factor of Safety: All load-carrying parts shall be constructed so that the static stress under full load conditions will not exceed 20 per cent of the ultimate strength of the material used. The gears shall be designed for strength and wear in accordance with A.G.M.A. practice.

(5) Hoist Frame: The hoist frame shall be made of steel members and all load-supporting hoist parts subjected to tension shall be of steel. The hoist frame shall be a ductile shock resistant unit and shall give adequate protection to the cable.

(6) Drum: The wire rope drum shall be made of steel with two steel flanges and machined grooved to receive the full lift of the hoist without overwinding. There shall be one full turn or cable remaining on the drum with the hook in the lowest elevation of rated lift. The ratio of the drum diameter to the cable diameter shall be at least the minimum approved by the Wire Rope Institute for the cable used, but not less than 20:1.

(7) Hoisting Cable: The wire rope shall be special flexible improved plow steel, 6 strands, 37 wires to the strand construction, with hemp center, consisting of pre-formed wire rope strands. The cable shall be equipped with swedged-on cable fittings for attachment to the hoist. The cable end attaching to the wire rope drum shall automatically detach when the lowest hook position has been exceeded. In that manner, reverse reeving of the cable on the hoist drum shall be prevented. The attachment of the cable to the hoist frame shall be accessible and shall permit convenient replacement of the cable. The wire rope shall be adequately and internally lubricated.

(8) Blocks and Load Hook: The bottom block shall be of the fully shrouded safety type and shall protect the cable and bottom sheave or sheaves. The sheaves shall be supported on self-lubricating bearings. The pitch diameter of the bottom block sheaves shall not be less than sixteen times the diameter of the rope used, and for idler or equalizer (non-rotating) sheaves shall not be less than twelve times the diameter of the rope used. The hook shall be drop forced steel, appropriately heat treated and supported on an anti-friction thrust bearing and shall swivel freely through 300 degrees rotation with full load.

(9) Gearing: The hoist gearing shall be fully enclosed in oil tight chamber and all openings provided with acceptable oil seals. The hoist bearing shall consist of a train of spur gears having modified 20° stud involute gear snape with contact surface hardened for wear resistance. The gear teeth shall be shaved and provided with axially curved tooth contour, which will deform under rated tooth loads to give a full tooth bearing without excessive end loading. The core of the teeth shall be ductile and shock resistant. The gearing shall be loaded within the safe limits approved by the American Gear Manufacturer's Association for the specified service. All gears shall be supported on anti-friction ball or roller bearings and, excepting the drum pionions, no centilever gear mounting is permissible. All gears shall be adequately lubricated.

(10) Lubrication: All parts not receiving lubricant from the central oil pool shall be lubricated through high pressure fittings, and they shall hold sufficient lubricant for long service periods.

(11) Brakes: The hoist shall be provided with two independent braking means: (1) an automatic mechanical load brake or (2) the motor brake alone shall be sufficient to sustain the rated load in any position.

The automatic mechanical load brake shall consist of multiple disc Weston type brake operating in an oil bath and engaging a silent pawl.

The electric motor brake shall be cam actuated solenoid released of the external jaw type and have only one adjustment to compensate for lining gear. A dynamically balanced impeller type brake wheel and a ribbed brake shoe construction shall insure adequate cooling of the brake. The brake lining shall be cemented to the shoe in an approved manner.

(12) Motors: Motors shall be totally enclosed ball bearing type designed for crane and hoist duty with a minimum of 275% starting torque and pull out torque. They shall be rated on 30 minute 55° centigrade rise duty cycle basis. When operating on 440 volt current, they shall be reconnectable. Motors shall operate on 480 or 208 volt, 3 phase, 60 cycle power source.

(13) Controls: Hoist control shall consist of a fully enclosed magnetic reversing switch, a pendant push button station and safety limit switch. The magnetic reversing switch shall have an enclosing case adequate for the particular application as specified. The controller shall be of ample size to safely operate at hoist duty and in jogging service. On AC hoists the control circuit shall be limited to 115 volts regardless of the potential in the hoist operating circuit. The controls shall be two speed.

(14) Limit Switch: The limit switch shall interrupt only the controller circuit of the motor and thus handle small current intensity. All hoists shall be equipped with upper hook travel limit switch, and this switch shall be so arranged that an automatic lowering circuit is established in case of hook over-travel, and the reverse motor

torque shall positively augment the action of the solenoid brake.

(15) Overload-Cutoff: Each hoist shall be equipped with a capacity or load limiting device capable of sensing the load on the hoisting cables. Such device, upon sensing a load greater than a specified percentage of overload (usually 25%) shall interrupt the raising control circuit and prevent the hoist from raising the load. The cutoff shall automatically reset upon the removal of the overload.

The overload-cutoff shall not increase the minimum headroom. It shall permit easy cable replacement and shall permit the use of standard swaged cable terminations. The overload cutoff shall not reduce the safety factor of the five to one minimum.

(16) Wiring: Electrical wiring shall be done in metal conduit and where practical, rigid conduit shall be used. All electrical work is to be in strict accord with the National Electric Code and performed in workmanlike manner. The push button cord shall be suspended on an "all-weather" oil resistant insulated flexible cable. An auxiliary steel tension member shall be attached to the hoist frame and the push button enclosure for the purpose of relieving the push button cord of any possible strain when the hoist is moved by pulling on the push button station. The flexible push button cord further shall be provided with strain relievers at the ends so that undue flexing of the cable shall be prevented.

(17) Painting: The hoist shall be painted according to the manufacturer's standard procedure.

(18) Testing: Each hoist unit shall be given a shop test with a load exceeding the capacity load by 50 per cent before shipment. The test shall be conducted according to the manufacturer's commercial testing procedure.

(19) Guarantee: The hoist shall be guaranteed against defects in material, workmanship or design for a period of one year, and parts, if found defective, shall be replaced free of charge.

(c) Trolleys: Trolleys for the hoists shall be SARB type motorized for the Main Building Pump Room. Trolley drives shall be effected using a fully enclosed 30 minute duly cycle rated motor conforming to NEMA Specifications. Drive details shall be similar to Specifications for the crane drive unit.

7.35 Payment: No separate payment will be made for work under this section of Specifications. The cost of such work and all costs incidental thereto shall be included in the amount bid for the item to which the work pertains..

SECTION NO. 8

ROADWAYS, WALKS, FENCING

8.01 Scope: Work under this section of Specifications consists of furnishing all materials and equipment, and performing all labor necessary for constructing roadways, roadway drains, walks, fencing, filter stone and underdrains, sludge bed media and drains, as shown on the drawing and specified herein.

8.02 Roadways and Walks: All plant and access roadways and paved yard areas shall have 8-inch, macadam base course. Except as may be otherwise shown on the drawings or provided herein, materials and construction methods shall conform to Standard Specifications for Highway Construction of the Georgia State Highway Department, as follows:

Section 207: Macadam Base Course

Construction and preparation of sub-grade, shall conform to Section 200 of the referenced Standard Highway Specifications.

(a) Walks: Walks shall be constructed of 4" Class "B" concrete.

(b) Excavation and Borrow: All excavation for roadways and walks shall be performed in accordance with the applicable provisions of the section "Site Preparation, Excavating, Backfilling and Grading" of these Specifications. Additional material necessary for fill shall be obtained from approved locations near the plant site.

(c) Grading: Grading shall be to elevations and contours shown on the drawings and in accordance with the applicable provisions of the section "Excavating, Backfilling and Grading" of these Specifications.

8.03 Fills: Where roadways and walks are constructed on fill, the embankment shall be placed in layers not over six inches deep as measured before compaction, and be thoroughly rolled to a solid, compact homogeneous mass with a sheep's foot or pneumatic tired roller. The work shall be carried out so that no places too steep to roll are left in the embankment. Portions inaccessible to the roller shall be rammed by hand. All material shall be visibly damp. Water shall be applied as directed to obtain close adhesion between layers and all parts of the material.

(a) Sheep's Foot Roller: The sheep's foot roller shall be of a self-cleaning type with feet projecting seven inches from the shell and of such weight that the load on each tamper foot with the drum empty will not be less than 100 pounds per square inch of area in contact with a plane surface. Rolling shall be carried on until the feet will leave no appreciable imprint when the shell is filled to maximum weight.

(b) Pneumatic Tired Roller: Pneumatic tired rollers shall be suitable for ballast loading which will give a minimum compression under working conditions of 325 pounds per inch width of tire thread. Forward and rear tires shall make separate tracks. Compaction shall be equivalent to that required for the sheep's foot roller.

(c) Materials: Within the limits of the roadbed and within the limits of the structural walls the fills shall be constructed of selected clay materials from excavation and borrow, free from stones larger than four inches in diameter. Slopes of roadway and slopes of fills outside the above limits may be constructed of alternate layers of rock and clay; in no case shall rock be qllowed in nests. The stones shall be uniformly distributed over the preceding clay layer and the voids shall be completely filled with clay so as to form a solid compacted embankment.

8.04 Fencing: Provide a complete protection type fence around the water plant as shown on the drawings. The fence shall be seven feet high overall, consisting of 2" mesh x 9 gauge x 72" galvanized after weaving fabric and 3-strand barbed wire on galvanized pressed steel post tops, 2-1/2" O.D. (3,652 lbs. per ft.) galvanized line posts, 3" O.D. (5.79 lbs. per fot.) galvanized end, corner and 4 ft. gate posts, 4" O.D. (9.109 lbs. per ft.) for gate posts more than 8-ft. double opening, 1-5/8" O.D. (2,272 lbs. per ft.) galvanized top rail with extra long pressed sleeves. Terminal, corner and gate posts shall have the necessary strut and tie bracing. Equip gates with heavy duty latches, keepers, gate stop for double gates and heavy duty hardened bronze padlocks with duplicate master keys. Gate frames shall be of 2" O.D. (2.717 lbs. per ft.) galvanized pipe with welded corners. Set posts at not more than 10-foot centers full 3 feet deep in concrete footings poured the full size of holes as excavated.

At Contractor's option, 2-1/4" galvanized H. Beam line posts (4.1 lbs. per lin. ft.) may be substituted for 2-1/2" O.D. pipe line post.

8.05 Payment: No separate payment will be made for work under this section of Specifications. The costs of all such work, and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.

SECTION NO. 9

MECHANICAL EQUIPMENT

9.01 Scope: This section of Specifications concerns mechanical equipment as follows:

(a) Raw Water Intake Equipment

(b) Chemical Feed Equipment

(c) Instrumentation and Metering Equipment

(d) Floculation and Sedimentation Equipment

(e) Filter Equipment

(f) Finished Water Pumping Equipment

9.02 General Requirements for Pumping Equipment: All pumping equipment shall be furnished in accordance with the following general specifications.

(a) Warranty: A warranty of one year after the 30-day operating period shall be provided by the pump manufacturer. Any service required or replacement parts required during this period shall be furnished by the pump manufacturer.

(b) Instruction Manuals: Upon completion of the work required under these Specifications the Owner shall be provided with three (3) sets of complete operation and maintenance manuals.

(c) Spare Parts: Each pump shall be provided with the following spare parts furnished in a suitable chest with locking arrangements.

Horizontal Pumps	Vertical Pumps
1 - Pump thrust bearing	1 - Motor thrust bearing
2 - Pump bearings	1 - Set of wearing rings
2 - Motor journal bearings	
1 - Set of wearing rings	Special tools if required for dismantling pump
2 - Shaft sleeves	
1 - Set of packing	
1 - Set of gaskets	

(d) Test of Pumping Units: The pump manufacturer shall conduct hydrostatic and performance tests for each pumping unit. Performance tests shall consist of determination of capacity, horsepower and efficiency at six points as follows: (1) Shut-off head; (2) 10% above maximum operating head; (3) Maximum operating head; (4) Design head; (5) Minimum operating head; (6) 10% below minimum operating head. Determinations shall be made at specified suction lift except for the last point, which will be made at a 1 foot suction lift for horizontal pumps. All tests shall be made in accordance with the Hydraulic Institute Test Code and shall be certified by a factory official. Hydrostatic tests of the pump casing shall be made at 150% of the pump shut-off head. The pressure

shall be held for 30 minutes with no evidence of strain or leakage.

Pump motors may be tested separately for non-witnessed tests. The pump may be partially disassembled if required for space limitations. In either case the method of correcting for these factors shall be approved by the Engineer prior to the test. If actual motors are not used for testing pumps, efficiency tests shall be run on the motors in accordance with applicable test codes. Motor efficiency tests may be omitted for pumps of 500 horsepower or less.

Pumps failing performance tests or hydrostatic test are subject to rejection.

(e) Factory Testing Motors: Motors shall be given the standard "short commercial test" according to the character of the motor. Four certified copies of such tests are required.

(f) Working Drawings: Four copies of each of the following shop drawings and additional pump and motor data are required.

(1) Outline dimensions of pumps and motors including size and location of connections to accessory equipment.

(2) Installation drawings with particular reference to sleeves and anchor bolts.

(3) Cut-away drawing showing construction.

(4) Weight of the complete unit and individual parts.

(g) Standardization: All working parts of the pumps and motors such as bearings, shaft sleeves, wearing rings, etc., shall be of standard dimensions built to tolerances such that parts will be interchangeable between like units, and such that the Owner may, at any time in the future, obtain replacement and repair parts.

9.03 Raw Water Pumps: The following pump characteristics and materials are required except that materials of similar characteristics, but slightly different composition may be substituted if listed in the Proposal.

Number Required	1	1
Design Capacity (gpm)	5,600	8,400
Max. Operating Head (ft.)[1]	92	92
Design Head (ft.)[1]	78	82
Minimum Operating Head (ft.)[1]	65	65
Maximum Shut-off Head (ft.)		
Number of Stages	1	1
Maximum rpm	900	900
Minimum Pump Efficiency (%)	84	84
Horsepower Motor[2]	300	300
Size Column (in. O.D.)	20	20

[1] Column and discharge head losses are to be added to the above.

[2] Motor sized for future conditions.

Shaft Material		416	Stainless Steel
Impeller	S.A.E.	63	Bronze
Bowls	ASTM	30	Cast Iron
Wearing Rings	S.A.E.	660	Bronze
Column			Steel
Flange Bolts		416	Stainless Steel
Shaft Enclosing Tube			Genuine Wrought Iron

(a) Operating Conditions: The vertical turbine pumps are to operate and be designed for the conditions shown on the plans.

(b) Pump Details: Each pumping unit shall be of the vertical turbine type with closed impeller, single stage, oil lubricated, conforming to A.W.W.A. Specifcation E101-61 except as otherwise specified. See Sketch No. 4 for arrangement details. Each part of the pumping unit shall be as follows:

(1) Bowls: Bowls, diffusion vanes, suction bell and discharge nozzle shall be cast iron, precision machined and hand worked until free of irregularities. Outside surfaces shall be dressed smooth. Bronze casing wearing rings shall be furnished. Enameled bowls are not acceptable. Furnish bronze basket type strainers.

(2) Impellers: Impellers shall be bronze, enclosed, of one piece construction. The impeller castings shall be roughed, cleaned, sand-blasted and hand machined. Patching of imperfections in impeller castings will not be permitted. The impellers shall be polished to a smooth finish and dynamically balanced. The impeller hubs shall be bored and key seated for the full depth of the hub. The impellers shall be keyed to the shaft by 416 stainless steel keys. The impellers shall be furnished with bronze wearing rings.

(3) Impeller Shaft: The impeller shaft shall be constructed in one piece, suitable for 350 horsepower or the largest impeller which will fit in the bowl assembly, whichever is less. The shaft shall reach from the bottom shaft bushing to a suitable distance above the discharge nozzle. Shaft bushings shall be removable, of bronze, and secured to the diffuser vanes in such a manner that rotation in either direction will not dislodge the sleeves. The impeller shaft bushings shall provide reasonably watertight joints. A sand guard shall be provided for the bottom bushing. The impeller shaft shall be of 416 stainless steel

(4) Line Shaft: Line shafts shall be constructed of 416 stainless steel and shall be oil lubricated. The oil column shall be of genuine wrought iron and supported by bronze spiders with rubber bushings at 10'-0" intervals. The line shaft shall be supported inside the oil column by bronze bushings at 5'-0" center to center. Shafting shall be coupled by screwed couplings of 416 stainless steel except for the coupling directly below the motor, which will be flanged and keyed. The line shaft shall be designed for 400 H.P. at 900 rpm with 15,000 lbs. of thrust.

(5) Discharge Column: The pump discharge column shall be 5/16-inch wall steel pipe with screwed-on flanges, Class 125. The flanges

shall be provided with bronze, "Everdur" bolts. The shaft enclosing tube shall be of extra strong genuine wrought iron.

(6) Discharge Head: The discharge head shall be of fabricated steel or cast iron with drip lip. A 1" thick separate steel base plate shall be provided. Lifting rings on the discharge assembly adequate for lifting discharge head, column and bowls as a unit shall be provided. The base plate and discharge head shall be designed to allow removal of a 30-inch diameter bowl assembly. Provide packing, packing follower, solenoid oiler, sight feed oil valve and a combination air vacuum valve of 1" size or larger if required. The pump manufacturer shall furnish cadmium plated anchor bolts.

(7) Painting: Pump, bowls, discharge and oil column, and discharge head shall be painted with one shop coat of Inertol Rust Inhibitive Primer No. 621. The pump column interior shall be coated with three coats of Inertol No. 49 Thick, total minimum dry film thickness 12 mils.

(c) Motors: The electric motor shall be a 300 horsepower, vertical hollow shaft, 1.15 service factor motor designed for an elevation of 700 feet above sea level and for an ambient temperature of 40° C. Motor temperature rise may be either 40° C. with Class "A" insulation or 60° C. with Class "B" insulation. Each motor shall conform to the latest NEMA Standards, A.S.A. Standards for Vertical Rotating Machinery, and A.I.E.E. Test Code for Vertical Type Induction Motors. Motors shall be dynamically balanced to within .0005. Motors in the base bid shall be as manufactured by General Electric, Westinghouse or Allis-Chalmers. Motors shall have terminals sized for NEC rubber conductors.

(d) Motor Design - General: Motors for all pumping units shall be designed and manufactured so as to be in accordance with the following specification, based on vertical type induction motors. All motor parts shall be made to standard dimensions and limit gauges so that replacement parts may be ordered without returning the part to be replaced to the factory for duplication.

(1) Stator Frames: The stator frames shall be of fabricated or of cast construction of such design as to give ample strength and rigidity for the supporting and anchoring of the stator punchings, and in the case of the bearing designs to adequately support the weight of the rotating parts.

(2) Stator Cores: The stator cores shall be built up of thin sheets of high grade, low loss, silicon sheet steel, with each lamination coated with high grade insulating enamel. These laminations securely supported and clamped under heavy pressure in the stator frame shall produce a structure with ample strength to maintain alignment.

(3) Stator Coils: The stator coils shall be of the form-wound type, completely insulated before being placed in the stator core slots. The coils shall completely fill the slots, shall be held in place by suitable non-shrinking wedges; and particularly at the ends shall be of adequate strength to withstand the mechanical forces caused by the high currents which may at times pass through them. The coil insulation shall have high dielectric strength and low dielectric loss.

The processes of winding, forming, pressing, taping, impregnating, and baking shall be accurately controlled to assure uniform thickness, high mechanical strength and a non-shrinking coil.

(4) Rotors: The rotors shall be designed to safely withstand the peripheral and axial forces of operating at 125% of normal rated speed in either direction of rotation.

(5) Bearings:

a. Thrust: Both units shall be provided with properly designed thrust bearings standard with the motor manufacturer and that are capable of handling the required thrusts. The thrust bearings shall be capable of handling other momentary thrusts during the starting conditions with the discharge valve in the closed position. The thrust bearings shall be capable of operating satisfactorily within 10 minutes after the unit has been shut down from a continuous operating period.

b. Guide: The guide bearings shall be solid roller or ball type and shall be designed for ample capacity to maintain shaft alignment at all conditions of operation including momentary up thrusts as produced by the starting of the units.

(6) Shaft: The shaft for each motor shall be hollow shaft type constructed of standard high carbon steel S.A.E. 1020 with true alignment and of suitable diameter to develop the necessary torque required. The pump shaft coupling shall be a standard two piece type with suitable coupling bolts and the top connections to motor shall be furnished with a self-release type or non-reversing coupling without the non-reversing ratchet pins.

(7) Shop Coating: All iron or steel parts shall have a rust-inhibiting primer coat applied as shown as they are produced, before any rusting has set in. The motor exterior shall be given a finish coat of manufacturer's gray paint satisfactory to receive the finish painting coat specified. Shaft extensions finished bright shall be given a generous coat of rust-inhibiting slushing compound which can be removed with common solvents.

(e) Motor Controllers:

(1) General: The electric motor controllers for each pump motor shall be as manufactured by the motor manufacturer, all in accordance with the following specifications. Each controller for the pump motors shall have not less than 150 MVA, 3 phase interrupting capacity, 2,300 volts, 3 phase, 60 cycle for across the line starting. Each starter shall be designed, tested and assembled in accordance with applicable standards of A.S.A., A.I.E.E., and N.E.M.A. requirements.

a. High Voltage Starters: Two starters for 2,300 volt pump motors shall be furnished. All starters shall be of the same

general construction, front connected, with roll out air break contactors, and with incoming cables, motor leads and control wiring from below.

1. Enclosures: The starters for each motor shall be furnished complete, with all internal wiring connected to properly labeled terminals in a rigid, free standing, self-ventilated NEMA Type 1 metal enclosure, divided into high and low voltage compartments. Doors shall be of rigid, non-warping construction with sturdy hinges to prevent sagging and permitting greater than 90 degree swing. Door handles shall be provided with locks. The HV door shall be interlocked with the contactor to prevent door to be opened with the contactor closed or to close contactor with door open. The manufacturer shall effectively electrically bond all parts of the enclosure and its barriers together and provide ground connection bolts for connection to the grounding system. Provide solderless connectors for all power and control wiring. Provide sub-compartments for the 2,400 volt bus and incoming cables with ample space for wiring operations in addition to the HV and LV compartments. Construction shall be such that the units will require grouting in place. Provide removable lifting angles, Approximate required dimensions of the starter units are shown on the drawings.

2. Isolating Device: The removal of contactors from operating position shall disconnect the contactor and fuses from the power and control circuits. This shall also close shutters to prevent body contact with live parts in the HV contactor compartment.

b. Starters for Vertical Pump Motors: Incoming power cable to the top section shall be in a compartment separated by a barrier from both HV and LV compartments. The starter for each motor shall include:

One - 600 ampere vertical bus.

One - Draw out assembly, externally operated, consisting of:
1 set - Current limiting fuses.
1 - Air break 3 pole contactor.

One - Control power transformer (230 volt secondary) with primary fuses, of capacity to handle contactor, motor heaters and associated relays.

Two - Current transformers.

Two - Thermal overload relays, temperature compensated, manual reset.

One - Time delay under voltage relay.

One - Set of relays and interlocks for proper operation of associated check valve.

One - Set of terminals for plug in of test instruments.

One - Ammeter, flush mounted, with transfer switch.

One - Elapsed time meter.

One - Interlock for solenoid oiler.

One - START-STOP push button with RED run light and terminals for duplicate push button station with RED run light on remote control console with low voltage relays for remote starting.

One - Set of terminals for connection to lightning arrester.

(f) Interior Wiring for Controller: The controller manufacturer shall do all necessary interior wiring required for the controller to perform as outlined herein and provide necessary marked terminals for all exterior wiring required to operate the pump discharge valve, all as previously described, as well as any other terminals that may be required for the controllers. See one line diagrams.

(g) Certified Drawings: The manufacturer bidding on the equipment specified shall have the controler manufacturer furnish necessary certified wiring diagrams to show complete internal wiring system of the controllers all as specified previously. The wiring drawings shall be submitted to the Engineers for approval before assembling and wiring the controllers. Furnish not less than four (4) copies. In addition to the wiring diagrams furnish four (4) copies of certified drawings of the controllers showing all necessary details and operating instructions.

9.04 Flushing Water Pumps: Furnish and install two vertical turbine type pumps for service water. The pumps shall be furnished as follows:

(a) Table of Pump Characteristics:

Number	3 and 4
Capacity at Design	175 gpm
Design Head	220 feet
Maximum Shut Off Head	345 feet
Maximum RPM	1750
Minimum H.P. Motor	15
Minimum Efficiency at Capacity	75 per cent

(b) Pump Details: Each pumping unit shall be of the vertical turbine type, multi-stage, water lubricated, conforming to A.W.W.A. Specification E101-61 except as otherwise specified. Furnish guaranteed performance curves for approval; furnish certified test curves prior to shipment. Each part of the pumping unit shall be as follows:

(1) Bowls: Bowls shall be of cast iron.

(2) Impellers: Impellers shall be bronze enclosed type.

(3) Shafting: Line shaft and impeller shafting shall be of 304 stainless steel.

(4) Discharge Column: The pump discharge column shall be 6" Schedule 30 genuine wrought iron in 10-foot sections.

(5) Discharge Connection: The pump discharge connection shall be a 6-inch x 4-inch flanged tee, with bolting suitable for 125 psi flanged connections.

(6) Motor Base: A cast iron motor base shall be furnished with separate base plate. The entire pump shall be removable through the separate base plate.

(7) Motor: The pump motor shall be a vertical hollow shaft motor, 40° rise, 220/440 volts, 3 phase, 60 cycles, 1.15 service factor. The motor shall not be overloaded at design point and be overloaded less than 10% at any other point. The motor enclosure shall be weather resistant and be provided with a strip heater thermostatically controlled to prevent moisture accumulation in the windings. Encapsulated moisture resistant windings may be used in lieu of the strip heater.

(8) Manufacture: The pump shall be manufactured by Johnston, Layne-Bowler, or Peerless. The motor shall be manufactured by General Electric, Westinghouse or Allis-Chalmers.

9.05 Traveling Water Screens: Furnish and install two traveling water screens. The screen units shall consist of screen baskets, spraying system, drive unit, semi-enclosed housing and cast iron inserted guides. The screen baskets shall be mounted on two strands of chain running over two sets of sprocket wheels at a speed of approximately 10 F.P.M. The screenings are to be removed from the trays by a spray system located on the operating floor. A concrete trough on the front of the screen will remove the screenings and spray water. The screen drive unit shall consist of a totally enclosed motor, driving an enclosed helical gear reducer.

(a) Manufacture: The screen shall be furnished as manufactured by Chain Belt Company, "Rex" Standard Model, or by Link-Belt Company, Standard Model 45; 5'-0" tray widths, distance bottom of well to operating floor as indicated on drawings.

(b) Operating Conditions: Minimum operating depth of water will be 5'-6". Normal operation of the screen shall be for 3 inches loss of head with maximum of 6 inches. The screen shall be designed to operate at 2'-6" loss of head to meet emergency conditions.

(c) Screen Operation: It is intended that the traveling screen shall operate normally when the raw water pumps are operating, and that the operation of the screen shall be intermittent by pneumatic level control, or may be continuous by manual control.

(1) Drive: The screen shall be driven by a squirrel cage, constant speed 1,800 RPM motor of ample power to start the screen at a loss of head of 2'-6" due to material clogging the screen baskets and occurring at a high water depth without overloading. The motor shall

be a 55° C rise, totally enclosed, ball bearing motor, and shall conform to the Standard Specifications of the A.I.E.E. Motor horsepower shall be not less than 1.5 HP, and for 240 volt, 3 phase, 60 cycle service.

Drive unit speed reducer shall be of the helical gear type, fully housed, running in oil, with anti-friction bearings throughout. The speed reducer and motor shall be mounted on the screen splash housing. Reducer shall be Faulk or approved equal.

Drive from the slow speed reducer shaft to the screen headshaft shall be by means of a heavy steel roller chain with an ultimate strength of not less than 48,000 lbs. Drive chain shall be outside of the splash housing and covered by a metal chain guard, running in an oil bath. All parts of the screen shall be designed to withstand the full N.E.M.A. rated stalling torque of the motor without failure.

(2) Chains: Screen chains shall be 24" pitch with offset sidebars. Sidebars shall be 40-50 carbon steel, 2-3/4" wide x 3/8" thick.

Chain rollers, case-hardened steel, shall be not less than 3-3/4" diameter and the chain pins, case-hardened steel not less than 1-1/4" diameter drilled for lubricated chain joint and fitted with an Alemite fitting. Chain bushings shall be case-hardened steel and of the tubular type with drive fit into the sidebars. Chains shall be for a working load of 15,000 lbs. and shall have an ultimate strength of not less than 90,000 lbs.

(3) Sprockets: Headshaft sprockets 6T - 24" pitch, semi-steel with renewable heat-treated stainless steel tooth inserts shall be keyed firmly to the shaft. The drive sprocket shall be made of semi-steel the teeth being ground accurately to fit the chain.

Semi-steel footshaft sprockets shall be fitted with bronze bushings, suitable for underwater service under gritty conditions.

Drive sprocket shall be 8 tooth, 8.04" pitch diameter. Driven sprocket shall be 56 tooth, 45.71" pitch diameter. Minor variations in sprocket diameters will be permitted, subject to the approval of the Engineer.

(4) Shafting: Headshaft shall be cold finished steel, straight and true, 3-15/16" diameter with bronze bushed cast steel bearings. These bearings act as a takeup, actuated by a #416 stainless steel Acme thread screw, cast iron capstan fitted with a bronze nut and a ball bearing thrust collar.

(5) Baskets: Screen basket frames shall be of 1/4" thick carbon steel, welded type frame construction, with curved end plates or shrouds to act as a side seal disc in the boot and formed steel longitudinal members so shaped that an anticulating joint or seal is maintained between successive baskets with clearance not over 1/16".

Screening medium in the baskets shall be #14 W & M gauge semi-hard drawn copper screen cloth with 3/8" square openings. Furnish sand lips at each basket.

(6) Guideways: The equipment manufacturer shall furnish cast iron guides to be placed in the concrete; as indicated on the drawings.

(7) Frames: The main frames shall be of substantial structural construction, well stiffened and cross braced for rigidity and of 3/8" minimum thickness of plates. Running clearances not in excess of 1/4" are to be provided to prevent binding of baskets in the runways.

Heavy angle tracks shall be furnished for chain runways on the front or ascending side of the screens. Such tracks shall terminate at the lower end with a hard iron casting or similar device which will act as a takeoff shoe to prevent weaving action of chain.

Head frame shall be provided with a splash housing on the front side having a hinged type inspection door at least 1'-4" wide x 3'-0" high. Inspection door shall be completely sealed with foam rubber gaskets and held in place with toggle type star knobs.

(d) Spray System: The screen shall be provided with a genuine wrought iron pipe spray system having a single row of aluminum bronze spray nozzles. The spray nozzles shall be of the non-clogging venturi throat type. Nozzles shall be threaded with header pipe having tapped hole.

(e) Painting: All steel work shall be thoroughly cleaned and shall have a priming coat of Inertol Rust-Inhibitive Primer No. 621 prior to shipment from the manufacturer. Field surface preparation and coating shall be in accordance with Section No. 11 of these Specifications and shall be performed by the Contractor.

(f) Twenty-five (25) shear pins shall be furnished by the equipment manufacturer as spare parts.

9.06 Screen Control Equipment: Level controls for two traveling water screens shall be furnished and installed. The level controls shall consist of a differential pressure relay actuated from two bubble tubes, one upstream and one downstream of the screens which sense the water level. When the differential water level across the screen reaches a pre-determined value then the differential pressure relay will cause the screen and screen flushing pump to start; at a higher differential an alarm will be actuated. The screen operating differential will be from 0 to 12-inches; the screen alarm differential will be from 0 to 24-inches. Furnish four 8-inch illuminated dial indicators to indicate upstream and downstream water levels for each screen.

Screen controls shall be mounted in a 10 gauge steel free standing enclosure, enclosed front, back, sides and top. The panels shall be painted ASA 49 Gray and shall have front cabinet type access. Lamicold type nameplates shall be provided for each function. A panel disconnect switch shall be located on the panel front. Screen controls shall be as manufactured by BIF, Healy-Ruff or Autocon. All piping requiring connection to external equipment shall be piped to a terminal strip at the bottom of the panel.

9.07 Air Compressors and Accessories: Furnish and install two Bell and Gossett air compressors Model No. SYC12-1, 1/2 horsepower, single phase, 240 volts, or approved equal, mounted on top of a 30 gallon A.S.M.E. vertical receiver, designed for 100 psi working pressure. Accessory equipment shall be as follows:

(a) Pressure switches to cut compressors on at 60 and 65 psi and off at 40 and 45 psi.

(b) Base plate, lifting handles, relief unloading and check valves for compressors.

(c) Manual provisions for alternation by means of transfer plugs.

(d) One - Hankinson Model M-100 Condensifilter with automatic drip trap.

(e) Small piping, valves, fittings and electrical equipment required for the complete installation.

(f) Three spare filters for the above air filter unit.

(g) Two solenoid valves (1/2"), normally closed, for cooling water supply.

9.08 Eductors: Furnish and install two sand eductors, 4-inch discharge and 3-inch pressure; of cast iron construction, bronze fitted, complete with agitating jets. The eductors are to be operated by two flushing water pumps designed to deliver 175 gallons per minute at 220' of head. The eductors are to deliver 72 gallons per minute or more at 32 feet total head. The eductors shall be as manufactured by Schutte-Koerting, or approved equal.

9.09 Chemical Feed Equipment: Chemical feed equipment shall be furnished and installed and shall consist of the following:

(a) Four Volumetric Feeders

(b) Liquid Alum Feed Equipment

(c) Chlorination Equipment

(d) Activated Silica Equipment

(e) pH Monitoring Equipment

(f) Repair and revise existing W & T Series A-690 fluoride feeder to include a scale mounted Series A-639 loss-of-weight recorder. Recorder to include high and low alarm actuator, direct reading hopper contents register and 400 charts.

9.10 Manufacture: Chemical feed equipment shall be furnished as manufactured by Wallace and Tiernan, BIF, or approved equal. Chlorination equipment shall be as manufactured by Wallace and Tiernan or approved equal.

9.11 Control Console: The main plant control console will be furnished by the manufacturers of metering and instrumentation equipment. Pneumatic controls for chemical feeders will be mounted in the metering console by the feeder manufacturers.

9.12 Volumetric Feeders: Furnish and install four volumetric feeders, one alum or pre-lime, two post-lime and one activated carbon. The feeders shall be of the screw type, with intermittent clutch drive as manufactured by Wallace and Tiernan, or screw type in which feed rate is governed by controlling the percentage of rotation. Each feeder shall be provided with manual adjustment of

feed rate and shall have a feed rate counter. Other details shall be as follows:

(a) Alum or Pre-Lime Feeder: The alum or pre-lime feeder shall be equipped with a 35 gallon fiberglass solution tank, feed hopper with dust collector, rotameter, aspirator type dust arrestor, mechanical mixer, all as specified. Controls shall be automatic start-stop by means of a signal from the raw water meter.

(b) Carbon Feeder: The carbon feeder shall be equipped the same as the alum or pre-lime feeder except for controls which will be manual. A carbon pump and float operated make-up tank will be furnished and installed. The make-up tank shall be of 100 gallons capacity. The carbon pump shall be Allis-Chalmers Model F-4, all 316 stainless steel construction with conventional packing. Pump design shall be 40 gpm at 70 feet head, with minimum 3 HP motor, 1,750 rpm, not overloaded more than 15% on curve. Spray nozzles equal to Monarch Fig. 631, shall be furnished and installed in filter influent channels. Pump and spray piping shall be as shown on the drawings.

(c) Post-Lime Feeder: The post-line solution tanks shall be of fiberglass approximately 35 gallons capacity, with water inlet, rotameter, overflow, feed and drain connection, dust arrester and motor driven agitators. The tanks shall support the feeders mounted on them. Dust arrestors shall be aspirator type discharging to drain. Control shall be from the effluent summator.

(d) Lime Hoppers and Accessories: Furnish and install one lime, bucket elevator to feed two feeders, each with 16.8 cubic feet hopper with high and low level bin switches, as shown on the plans. The bucket shall be of 4 cu. ft./min. capacity, consisting of a load section with loading hopper, hopper vibrators, with timer and controller, hopper mounted dust collector, and chain mounted buckets in casing. The top section shall include drive and gear reducer, motor, chain operated diverting gate with limit switches for two machines and discharge chute with flexible connection.

High level bin switches and diverting gate limit switches shall be arranged in series so as to shut down bucket elevators when the respective hopper is full.

The drive motor shall be 1/2 HP, three phase, 208 volts. The casing shall be galvanized steel, with carbon steel buckets. The dust collector shall be as described in 5.05(d).

9.13 Liquid Alum Feed Equipment: Furnish and install two plunger type Simplex metering pumps, Wallace and Tiernan, Series 200-A or equivalent BIF Model with capacities of 72 gallons/hour each. The pumps shall be equipped with pneumatic stroke positioner, and spring loaded back pressure valves. The pump stroke shall be controlled by a lineal 3 to 15 psi pneumatic signal.

9.14 Carbon Pump: A stainless steel dilution pump, Allis-Chalmers, Model F-4, will be furnished and installed for carbon feed.

9.15 Chlorination Equipment: Chlorination equipment shall basically consist of one new 1,000 #/24 hrs. capacity chlorinator, two new 400 #/hrs. capacity chlorinators and one existing chlorinator to be modified and installed in modular panel, capacity 400 #/24 hrs., with pneumatic controls, four chlorine injectors, five diffusors and accessories. Details shall be as follows:

(a) Chlorinators: Chlorinators shall be of the variable orifice type in which chlorine gas is metered in a vacuum and the orifice differential is maintained at constant vacuum. The units shall consist of a chlorine pressure reducing valve, vacuum regulating valve, variable orifice, rotameter feed rate indicator, pressure vacuum relief valve, and aspirator type injector. The chlorine pressure regulating valve maintains proper operating vacuum ahead of the variable orifice and provides a positive chlorine shut-off if operating vacuum is lost. The vacuum regulating valve maintains the proper operating vacuum downstream of the orifice and the pressure-vacuum relief valve provides safety pressure and vacuum relief. These valves shall be separate units. The rotameter feed rate indicator shall have a 20:1 range and be calibrated in pounds per 24 hours. The flow signal from the raw water meter will actuate raw water and spare chlorinators and the flow signal from the filter effluent summator will actuate the post chlorinator.

(b) Chlorine Injectors, Diffusers and Piping: Chlorine injectors shall be installed at the chlorinator panel and at the raw water point of application. Injectors, diffusers and chlorine piping shall be as shown on the plans and as follows:

(1) Injectors: Four injectors are required.

Injectors shall be of the fixed throat adjustable plug, anti-siphon type with pilot operated shut-off valve, and shall utilize water pressure to produce operating vacuum for the chlorinators, receive the chlorine gas and discharge it as a solution to the points of application. The injectors shall be controlled from switches located on the chlorination panel. Strainers, gages, and shut-off valves shall be provided for all injector water supply lines. Provide separate pressure regulators for two chlorinators.

(2) Solution Piping: The chlorine solution discharge piping shall be Schedule 80 PVC with four PVC and one rubber lined and rubber covered diffusers.

(3) Gas Piping: The gas piping from the chlorinators to the injectors in the building shall be PVC Schedule 80 with ball-type PVC valves. The piping shall be arranged in a manifold as shown on plans.

The chlorine gas piping from the cylinders to the chlorinators shall be extra heavy wrought iron black pipe with malleable fittings. The manifold header valves, line valves, pressure reducing valve; chlorine pressure gages and fittings shall be supplied by the chlorinator manufacturer.

(c) Chlorinator Controls: Chlorination shall be controlled manually according to dosage and automatically according to flow using pneumatic controls. A 3 to 15 psi pneumatic signal from the chlorinators shall operate the chlorine recorder, furnished by the instrumentation manufacturer and located in the instrumentation panel. Other chlorination controls shall be as shown on the drawings.

(d) Chlorination Panel: A chlorination panel of fiberglass or formica constructed according to provisions of Paragraph 9.26 shall be furnished and installed as shown on the drawings. This panel shall be furnished according to shop drawings supplied by the chlorinator manufacturer, or may be furnished by the chlorinator manufacturer.

(e) Chlorination Accessories: Furnish and install the following chlorinator accessories:

Three (3) extra rotameters;
Three (3) extra V-notch plugs;
One (1) precision pneumatic calibrating, portable type, FA235 range (-) 100" of water to (+) 24 p.s.i.;
One (1) extra chlorine pressure reducing valve for chlorinator;
One (1) external chlorine pressure reducing valve;
Ten (10) header valves for chlorine gas line;
Ten (10) flexible tank connections;
Four (4) Yoke type auxiliary cylinder valves;
Two (2) chlorine line gages;
One (1) two inlet - two outlet solution distributor;
One (1) three stream vareameter panel with two valves per stream and one spare vareameter.

(f) Chlorine Dioxide Equipment: Chlorine dioxide equipment shall consist of one chlorine dioxide generating tower of Pyrex glass with raschig rings; sodium chlorite solution pump of the diaphragm type; 55 gallon plastic solution tank with a steel drum overpack and polyethylene cover, agitator, and chlorine solution injectors. The water supply to the injectors shall be equipped with a solenoid valve for remote control.

9.16 Activated Silica Equipment: Furnish and install a complete integrated system for manual or automatic proportional control feeding of activated silica to the raw water. Major items of activated silica feed equipment shall be as follows:

1 - Chlorinator, as specified in Paragraph 9.15, capacity 400 #/24 hours with set of minor accessories including wrenches, gaskets, commercial lubricant, and necessary chlorine gas lines to silicator.

1 - Silicator, capacity 15 to 150 GPD of sodium silicate with solenoid valve, water pressure reducing valve, air operated shut-off gas valve for injector suction line and timer for start-stop control.

1 - Disphragm type metering for pumping sodium silicate with 1/4 HP 115/230 volt motor, suction tubing, discharge tubing, belt guard, spare gaskets and wall bracket for mounting pump.

1 - Pneumatic stroke positioner with set rate station for control of sodium silicate pump.

1 - Pneumatic receiver recorder with integrator for recording sodium silicate feed.

1 - 200 gallon capacity rubber lined tank equipped with gasketed cover, electrode controls, activated silica pump suction connection, vent and filling connections in cover.

1 - Duriron centrifugal pump, capacity 10 GPM @ 40 feet head, open impeller 1/4 HP, 115/230 volt motor, lantern ring flushing water supply with purge meter.

1 - Pneumatic transmitting vareameter of Hastelloy C construction, capacity 5 GPM activated silica, air set.

1 - 1/2" rubber lined Saunders type control valve with pneumatic controller and operator.

1 - Ratio relay.

9.17 Chlorine Residual Equipment: Chlorine residual equipment shall consist of a residual sampling cell and recorder. The sampling cell shall have two electrodes, one copper and one platinum with continuous grit cleaning arrangement, a flow regulating valve and buffer feed. The recorder shall be a direct-current recording micrometer which records the measured cell current and records it in parts per million. The sampling cell shall be located in the piping basement room floor and the recorder in the chemical monitoring panel. The chlorine residual equipment shall be as manufactured by Wallace and Tiernan or approved equal. Furnish an electric/pneumatic converter at the sample cell to produce a 3 to 15 psi signal to the recorder.

9.18 Chemical Feed Equipment Accessories: Chemical feed equipment accessories shall consist of vibrators and controls, mixers, starters and other accessories. Details shall be as follows:

(a) Vibrators: Lime hoppers shall be furnished with two vibrators and other hoppers with one vibrator, Syntron Model V-35 with timers and controllers.

(b) Mixers: "Lightning" mixers shall be furnished for each feeder, as follows:

(1) Lime Feeders: 1/4 HP, 1,725 RPM motor with 1/2-inch 316 stainless steel shaft, with 1 - 4" diameter three blade propeller.

(2) Carbon Feeders: Same as above, except with 3" diameter propeller.

Chemical feed equipment manufacturers shall furnish mixers adequate to provide proper agitation, exceeding the above requirements if necessary, but not less than the above requirements.

(c) Starters: Starters will be furnished under electrical specifications.

(d) Drawings: Complete shop drawings are required for chemical feed equipment including wiring diagrams for all accessory equipment.

9.19 pH Recorder, Transmitter and Duplicating Recorder: A pH cell with flow regulating valve, Beckman or approved equal, shall be installed as shown on the plans at the pump room floor. The pH signals shall be transmitted to a recorder located in the chemical monitoring panel, using an electric/pneumatic converter with 3 to 15 psi output mounted at the cell.

9.20 Chemical Solution Lines: Chemical lines shall be of Schedule 80 PVC, valves shall be ball type PVC.

9.21 Pneumatic Piping: Pneumatic piping shall be installed as indicated. Before acceptance all air piping shall be tested to 100 psig. Leakage in 4 hours shall not exceed 1 psi. Air piping shall not be smaller than 1/4" I.D. and shall be designed to deliver pressure to each unit as combined maximum usage 10 psig or

less pressure loss. Piping shall be as small as practicable to achieve the desired pressure drop.

The equipment manufacturer shall furnish detailed diagrams of pneumatic piping required to serve his equipment, including number and size; such piping shall be furnished and installed by the Contractor. Pneumatic piping buried in the ground shall be encased in genuine wrought iron conduit.

9.22 Equipment Specified Elsewhere: All recorders shall be furnished and will require 3 to 15 psi pneumatic signals. All air sets for use with transmitting and/or signal converting accessories shall be furnished. Feeders will be furnished with baked enamel finish.

9.23 Control of Feed Equipment: Chemicals fed automatically according to flow shall include liquid alum, pre-lime, and chlorine based on raw water flow with fluorides post-lime and post-chlorine according to effluent flow. Carbon feed shall be manual. All dosage shall be set manually with flow control by pneumatic signal to all devices. Volumetric feeders shall be controlled according to flow by conversion of the 3 to 15 psi signal to a time-impulse signal for intermittent operation. Alum pumps shall use speed control according to flow with dosage set by stroke. The chlorinators shall add the flow signal to dosage signal in order to obtain a plug position set point. Chlorine and alum signals showing feed rates will be transmitted to the feed control console recorders.

9.24 General Description of Metering Equipment: The following metering, instrumentation and control functions shall be furnished and installed under this section of specifications:

(a) Metering Equipment:

  (1) Raw Water Venturi Meter

  (2) Filtered Water Supply Meter

  (3) Filter Effluent Rate Controllers

(b) Instrumentation Equipment:

  (1) Tank Levels

  (2) Filter Gauges

  (3) Service Pressures

  (4) Telemetering Equipment

(c) Control Equipment:

  (1) Start-Stop Push Button for Pumps

  (2) Basin Level Controller

9.25 Manufacture: All equipment under this section of Specifications shall be furnished by the same manufacturer. Control consoles and filter operating tables may be furnished by the equipment manufacturer or a supplier approved by the Engineer. The equipment manufacturer shall furnish all wiring diagrams and

schematics. Metering and instrumentation equipment shall be furnished as manufactured by BIF, Simplex, or approved equal. Other equipment may be bid, provided it is in strict conformance with these Specifications.

9.26 Control Consoles and Filter Operating Tables: Control consoles shall be of highest quality construction. Dimensions shall be as shown on the plans. The panels shall be stiffened in a manner acceptable to the Engineers in order to provide a rigid panel without deflection in normal handling. Detail drawings of panel construction shall be submitted for approval. Details of panel construction and installation shall be as follows:

(a) Assembly, Piping and Wiring: Panels and consoles shall be factory assembled and tested. All electrical and pneumatic connections shall be made to terminal blocks. Terminal blocks shall be numbered and lamacoid function schedule and piping diagram attached to the rear of the panel indicating the function of each terminal strip. Terminal strips shall be located in the bottom of the panel. All units shall be completely accessible from the rear. Piping and wiring shall be shop tested before shipment. A certification of shop test will be required prior to shipment. No air leaks shall be acceptable. Chemical Feed Control equipment will be installed by the feed equipment manufacturer in the field. Terminals for electrical and pneumatic connections shall be furnished and factory installed under this section. All terminal blocks for the metering and instrumentation console shall be as specified on the drawings for each lead entering the panels.

(b) Panel Manufacture: Panels may be constructed of one of three types as follows:

(1) Formica: Formica and aluminum composite construction, using welded, extruded aluminum sections may be used. The formica panels and backing shall be of highest quality and of a type as approved by the Engineer. Aluminum sections shall provide a fit with the formica panel so that a rigid panel is provided. This type of construction may be used for main control panels only.

(2) Fiberglass: Fiberglass panels shall be manufactured as follows:

a. Filter Consoles: Filter consoles shall be free standing, constructed of molded fiberglass reinforced polyester liminate having a minimum wall thickness of 1/8". The ends and center section shall be chemically bonded and mechanically fastened to provide a unit structure. All joints shall be provided with a removable molded vinyl trim strip to provide a modern appearance.

The console laminate exterior shall be covered with an integrally molded gel coat 15 mils. in thickness to provide a smooth surface. The cabinet liminate shall be constructed by the use of 10 oz. fiberglass cloth, fiberglass mat, and 24 oz. woven roving and shall contain minimum of 35% by weight of fiberglass reinforcement. The color of the consoles shall be selected by the Engineer from samples submitted by the manufacturer.

All corners, excepting for the base shall be rounded and the cabinet provided with a flanged base for direct bolting to the

operating floor as shown on the drawings. The front of the cabinet shall be solid and the rear shall be fitted with a latched removable panel of material identical to the console cabinet.

b. Central Control Console and/or Chlorinator Panel: The panel front shall be of laminated fiberglass reinforced resin rigid core construction having a minimum thickness of 3/4" to provide sufficient rigidity and dimensional stability, in a continuous sheet.

The console section shall be of molded fiberglass reinforced polyester laminate. The back panel, as well as the console surface shall have a minimum thickness of 1/8" exterior to any rigid core reinforcement. The ends and center section of the console shall be chemically bonded and mechanically fastened to provide a unit structure. All joints shall be provided with a removable molded vinyl trim strip to provide a modern appearance.

The exterior of the back panel, as well as the console, shall be covered with an integrally molded gel coat 15 mils. in thickness to provide a smooth surface. The console laminate shall be constructed by the use of: 10 oz. fiberglass cloth, fiberglass mat, and 24 oz. woven roving and shall contain a minimum of 35% by weight fiberglass reinforcement. The panel facing shall be constructed using fiberglass mat and a minimum 1/2" rigid core material to provide maximum rigidity. The color of the panels and console shall be selected by the Engineer from samples submitted by the manufacturer.

All corners, except for the base, shall be rounded and the cabinet provided with a flanged base for direct bolting to the operating floor, as shown on the drawings.

(3) Stainless Steel: Stretcher leveled stainless steel, 10 gauge, Type 304 with stainless steel top and sides may be used for panel construction. Filter control consoles may be of stainless steel with weatherproof push-button stations.

(c) Status Board: The status board shown on the drawings may be of one of two types as follows:

(1) Inlaid Formica: The panel may be of inlaid formica using different colors to provide the proper contrast with lights rear mounted.

(2) Silk Screen: The panel may be constructed of 1/4" polished plate glass facing with silk screen graphics rear illuminated with lights as shown on the drawings.

In either case the graphic panel shall be of highest quality providing an attractive appearance, with rear access to light bulbs.

(d) Finish: Panels and consoles shall be finished as selected by the Owner. Finish samples shall be submitted for selection.

(e) Nameplates: Each instrument or control device shall have a suitable

plastic nameplate as selected by the Owner. Samples shall be submitted for selection. Nameplate titles are to be approved upon submission of drawings.

(f) Installation: Control consoles and panels shall not be shipped until structural work and masonry work is complete. Upon shipment panels shall be immediately stored in the building or in acceptable warehouse space. The panels shall be shipped in one section with plastic covers. (Strippable plastic coating will not be accepted.)

(g) Details of Internal Piping: Dual air sets and fine filters with isolating valves shall be furnished for each panel. All pneumatic instruments shall have individual shut-off valves, and drive shut-off switches. Each instrument shall be fused and provided with a separate switch to interrupt electric power. Electric wiring and pneumatic piping shall be color coded.

(h) Indicators and Recorders: Indicators and recorders shall have circular dials and charts with a min. dia. of 10-inches and shall be semi-flush mounted and provided with indirect fluorescent illumination. Receivers (indicators and/or recorders) shall have an accuracy of plus or minus 1% of actual rate. Totalizers as required shall be mounted in the recorder case. Indicator dials shall be of brass or aluminum with engraved figures on a white background. The manufacturer shall furnish 100 seven day charts for each recorder. Strip recorders shall be BIF, Model 287, or equal. Local indicators shall have an illuminated 12" dial.

9.27 Metering Instruments: All venturi meters shall be of the Hershel short form type, cast iron with approximately 120" differenital at maximum flow. The finished and raw water meters, and filter effluent rate controllers shall use linear pneumatic transmitters, mercury well type. Meter size and capacities shall be as in the following table:

Flow Meter Size and Characteristics

Designation	Bogart Booster	Raw Water*	Filtered Water Supply	Raw Water
Size	8"	30"	30"	20"
Maximum flow (mgd)	1.0	20	24	6
Maximum flow (mgd)	0.1	2	2.4	0.6
Max. Operating Press. (psi)	100	50	150	50

*Furnished with butterfly valve in throat.

The filtered water supply meters shall be designed to take backflow equal to the full meter capacity without injury to the transmitter.

9.28 Rate Controllers: Filter rate of flow controllers shall be 12" size in direct acting type BIF Model RCB or Simplex Type S. The controller shall be designed to regulate flow at rates from .75 to 3.0 million gallons per day. The controllers shall be accurate to within plus or minus 3% over the 4 to 1 range. Control shall be remote using basin level control or local from the filter operating table.

9.29 Level and Pressure Equipment: All required plant water levels shall be measured pneumatically by means of a pneumatic tube emitting air below the water

surface, and producing a back pressure on a pneumatic instrument in the control console. Pressures shall be measured at the upstream taps of the filtered water supply meter and transmitted to recorders located on the control console and to an indicator in the high service pump room, illuminated with 12" dial. Measurement ranges shall be as follows:

Location	Clearwell	Bogart Booster	Wash Water Tank	Filtered Water Supply
Minimum Pressure	0	0	0	0
Maximum Pressure	15 (ft.)	100	25	150 (psi)

On indicator dials at locations to be determined, red, high and low markings shall be inscribed.

9.30 Filter Gauges: Filter gauges shall be furnished and installed on the main control console as indicated on the schematic and other drawings and specified herein. Gauges shall consist of three units for each filter and shall be operated pneumatically from the rate of flow transmitters and loss of head transmitters to be installed as specified under the paragraph "Transmitters" of this section of Specifications. The three units to be provided for each filter shall consist of rate of flow, and loss of head and turbidity indicators.

(a) Pneumatic Operated Mechanisms: The operating mechanisms for filter gauges shall be of the flexible metallic bellows type constructed of corrosion resistant material throughout and actuated by the output of the pneumatic transmitters.

(b) Electric Operated Mechanism: Turbidity recording equipment shall transmit two signals from each filter, one for finished water turbidity and the other for turbidity at the interface between sand and anthracite. A 4 to 20 ma signal shall be transmitted to the main control console.

(c) Recorders: Furnish and install recorders for each system consisting of a one unit strip recorder for flow. A two unit strip recorder for head loss (total and interface) and a two unit strip recorder for turbidity. Recorders shall be similar to BIF Model 287-30 or 287-31 or equivalent electric signal unit.

9.31 Transmitters: Transmitters of the pneumatically operated type as indicated on the schematic drawings shall be furnished for operation of filter gauges specified above and shall be as follows:

(a) Rate of Flow Transmitter: The pneumatic rate of flow transmitter shall be of the mercury well type, shall deliver a signal ranging from 3 to 15 psi directly proportional to flow for operation of the filter gauges and for operation of the summator specified elsewhere in these Specifications. The pneumatic flow transmitter shall be similar to Model ATUAX as manufactured by Builders-Providence, Inc., or Model PN as manufactured by Simplex Valve and Meter Company. All transmitters shall be floorstand or bracket mounted.

(b) Loss of Head Transmitter: Loss of head transmitter shall be of force-balance type constructed of a series of non-metallic diaphragm assembly, and shall provide an output pressure ranging from 3 to 15 psi proportional to the difference in loading pressures and filter loss of head. Loss of

head transmitters shall be mounted on the exterior of the respective filter flow transmitter housing. Sediment traps shall be installed for each loss of head transmitter. Transmitters shall be similar to Model AT-SD as manufactured by Builders-Providence, Inc., or Model TD as manufactured by Simplex Valve and Meter Company, and shall be mounted on the rate of flow transmitter floorstand.

9.32 Master Filter Control System: A master control system shall be furnished and installed for control of the filter rate of all filters from the master control panel located on the operating floor. The panel shall include a master control system, shall be installed in the location shown on the drawings, and shall contain control equipment to perform the following functions:

(a) Permit selection of "Automatic" or "Manual" control of filter effluent rates of all filters at operator's option.

(b) Provide superseding control of filter rates when selector switch is in the "Automatic" position, so as to increase or decrease rates of flow of all filters when filter and basin level rises above, or falls below, a predetermined point. Filters shall all operate at equal rates of flow when controlled by "Manual" or "Automatic" control from the master control panel.

(c) To permit manual setting of rate of flow of all filters from master control panel when selector switch is in "Manual" position.

(d) To indicate set rate of flow of all filters with selector switch in either the "Automatic" or "Manual" position.

(e) To permit adjustment of basin and filter level set point and control band from master control panel and to indicate such levels on said panel.

The master control system for control of filter rates shall be actuated from a level control device located in the settling basin equalizing channel. This level control device shall transmit signals to a controller located in the main control console. The pneumatic controller shall permit adjustment of the control set point and control band, shall indicate set point and level and shall provide an output pressure ranging from 3 to 15 psi for control of filter effluent rate controllers. The level in the outlet flumes shall be maintained at wier level plus or minus one-inch.

9.33 Summator and Receiver: A pneumatic summator and receiver shall be installed in the instrument control panel for summating the flow of all new filters. The summator and receiver shall be located in the main control console.

(a) Pneumatic Summator: The pneumatic summation units shall be of the balanced diaphragm type, operating on the force balance principle and producing a pneumatic output signal of 3 to 15 psi directly proportional to the sum of flows through filter rate of flow controllers, as determined by pneumatic output pressures of filter rate of flow transmitters.

The output pressure from filter summation units shall actuate the receiver specified below.

(b) Receiver: The master control receiver shall be of the pneumatic type

and shall indicate the signal from the pneumatic summator. Range of this instrument shall be from 2.4 to 24 mgd.

9.34 Air Sets: Air sets shall be furnished and installed where shown on the drawings or specified. The air set shall be of the non-bleed type consisting of a pressure regulator, shut-off valve, filter and downstream pressure gauge.

9.35 Electrical Work in Connection with Control Consoles: Controls are to be installed in control consoles as shown on the drawings.

Push buttons and selector switches shall be heavy duty oil-tight variety GE - CR2940. Each group of devices shall have a proper nameplate indicating the function of the equipment to which it is connected. Pilot lights shall be DIALCO #514001 series with extended life lamps and appropriate color caps or lenses 125 V, 60 cycles.

9.36 Filter Control Consoles: Filter control consoles shall be as shown on the plans. Valves shall be operated by an electric system using pilot solenoid valves ASCO 8316 or approved equal with manual override. All devices shall be operated by start-stop push buttons and have open and closed lights with both burning to indicate intermediate positions. Push buttons and pilot lights shall be Crouse Hinds EMP 009 and EMP 019. Complete schematics of electrical and pneumatic controls shall be submitted for approval. Hydraulic piping shall be 3/4" diameter or larger if required. Solenoid valves shall be provided with NEMA IV enclosures.

9.37 Telemeter Circuits: Telemeter circuits for connection of a telemeter system to the Bogart Booster Station will be installed in the control console.

Tone equipment will be installed which permits the operation of the booster station on a single leased line. The following functions are required:

(a) Two pumps, start and stop for either or both units.

(b) Two pumps, report running for either or both units.

(c) Flow Measurement.

(d) Pressure Measurement.

Tone equipment shall be similar in function and equal to BIF equipment already installed. The equipment shall be mounted in a free standing painted steel enclosure matching the existing enclosure in size, color and texture.

9.38 Signals To and From Other Equipment: Master signals to control chemical feed equipment and chlorination equipment shall be furnished from the main control console. Two connections for each of the signals shall be furnished mounted on suitable terminal strips. One signal shall be from the raw water meter and one from the filter effluent summator. 3 to 15 pound signals to operate chemical feed recorders shall be furnished by the chemical feed equipment manufacturer. Furnish pneumatic/electric signal converters as shown.

9.39 System Accuracy: System accuracy for all metering, level sensing devices and other measuring equipment shall be plus or minus 2% of actual rate.

9.40 Air Compressors and Accessories: Air compressors and accessories for

pneumatic controls and other systems as indicated shall be furnished as an operating system including all accessories and complete piping and electrical schematics, either by the instrumentation manufacturer or by the air compressor manufacturer.

(a) Air Compressors: Two air compressors, Ingersol-Rand ER-1 or approved equal with 5-inch bore and 4-inch stroke, with 48 cubic feet per minute displacement of air shall be furnished and installed. The unit shall be driven by a 440 volt, 3 phase, 60 cycle, 7.5 HP motor. Furnish belt guards, and after coolers.

(b) After Coolers: Two after coolers capable of cooling 20 CFM of free air each shall be furnished and installed as shown on the plans. The after coolers shall be equal to Ingersol-Rand Type PL.

(c) Air Pressure Tank: An A.S.M.E. Code sir pressure tank suitable for operation at 100 psi gauge shall be furnished and installed. Pressure tank shall be tested at 150 psi and warranted safe and sound at this pressure. The compressor shall start at 50 psi and stop at 75 psi. If the pressure drops to 40 psi the second compressor shall cut-in. Furnish a 250 gallon receiver with safety valve set at 125 psi.

(d) Condenser-Filter: Filters shall be furnished and installed as shown on the drawings consisting of two Hankinson refrigerator filters.

(e) Main Air Regulator: The main air regulator shall reduce air pressure to 40 psig at 20 cfm.

(f) Air Piping: Air piping shall be installed as indicated. Before acceptance all air piping shall be tested at 100 psig. Leakage in 4 hours shall not exceed 1 psi. Air piping shall not be smaller than 1/4" I.D. and shall be designed to deliver pressure to each unit at combined maximum usage with 10 psig or less pressure loss. Piping shall be as small as practicable to achieve the desired pressure drop.

The equipment manufacturer shall furnish detailed diagrams of pneumatic piping required to serve his equipment, including number and size, such piping shall be furnished and installed by the Contractor. Pneumatic piping buried in the ground shall be encased in genuine wrought iron conduit, minimum size 3/4".

(g) Information Required for Air Supply: The instrumentation manufacturer and chemical feed control manufacturer shall submit air usage; minimum, normal and maximum for each instrument.

(h) Controls: Furnish all controls including starters required for operation of the equipment as shown on the drawings. Furnish and install panel mounted factory wired Autocon 7101 two circuit alternator and two size one combination starters with accessories as indicated on schematic diagrams. Furnish and install cooling water system, pressure switches, temperature cutouts and other devices as shown on the drawings. See Electrical specifications.

9.41 Turbidimeter: Furnish and install a turbidimeter system to measure filter effluent turbidity. The system shall consist of a reflected light .1 to 1.0 parts per million range primary instrument with standardization rod, a local indicator and a remote strip recorder. Equipment shall be of Hach or Minneapolis-Honeywell or equal manufacture. Electrical wiring between meter and register shall be in accordance with equipment manufacturer's published instructions.

9.42 Equipment in Monitoring Consoles: Two monitoring consoles shall be furnished and installed, one for distribution system control and the other for plant control. The distribution control console shall be installed as shown on the plans and complete with racks for telemeter equipment, as described previously. The control and monitoring console shall be as shown on the drawings. Electrical devices shall be G.E. Style CR-2940. Furnish all push buttons with run lights. All lights shall be wired to a test circuit. All electrical and pneumatic work shall be run to terminal blocks. Furnish complete wiring and piping drawings for approval including numbering of terminal blocks.

9.43 Flocculator Mechanism: The Contractor shall furnish and install mechanical flocculator mechanisms for the flocculation basins complete including revolving mechanisms, stuffing boxes, drive units, drive chains and sprockets, anchor bolts, pressure water lubrication system and appurtenances, as indicated on the drawings and/or as specified herein.

(a) Revolving Mechanisms: The revoling mechanisms shall consist of three (3) rows of 6-foot, 6-inch diameter rotating paddles, installed in the basin at right angles to the flow, with shafts extending through side wall for chain and sprocket drive mechanisms, and provided with suitable stuffing boxes. Paddle design shall provide maximum blade displacement at the basin inlet, and progressively decrease in the direction of flow to the outlet of the basin. The water displacement by the total area of the rotating paddles shall be within the range of 30 to 40 times the 4.5 MGD maximum flow rate through the basin.

(1) Construction: Each paddle assembly shall have two (2) structural steel arm supports welded to the shaft and cross braced to provide a rigid assembly. Paddle arms shall be structural steel angles to which 1/8 inch steel plate paddle blades, crimped for strength, shall be bolted.

(b) Shafts: The shafts of the flocculator mechanism shall consist of 4-inch O.D., 1/2-inch wall thickness, extra strong wrought steel pipe, turned and polished for bearing supports. The shaft shall be furnished in convenient lengths with connecting flanges, to provide for ease in handling and installation. Shafts shall be supported on concrete pedestals with bearings properly spaced to prevent undue deflection of the shaft.

(c) Underwater Bearings: Underwater bearings shall be cast iron, split, rigid type, with liner and bushings of Ryertex or other approved material, for pressure water lubrication. Bearing housing shall be provided with a pressure water connection for lubrication, and with slotted holes in base to permit shaft alignment.

(1) Pressure Water Supply: Pressure water supply lines shall be of Type K, hard drawn copper, with streamline fittings, and shall be connected to each bearing to provide adequate lubrication. Headers shall be run from dry well along concrete baffles, with laterals connecting to bearings, each lateral shall be equipped with a needle valve to regulate flow, and with union to permit disassembly. The header in the dry well shall be equipped with an air and vacuum release valve, and a solid wedge bronze shut-off valve.

(d) Dry Well Bearings: A self aligning ball bearing type pillow block in cast iron housing, with felt ring seals and pressure grease connection,

shall be provided for each shaft, and shall be located in the dry well.

(e) Drive: The drive mechanism shall be of the chain and sprocket type, with gear reducer assembly, for each shaft located above the dry well as indicated on the drawings. The drive shall provide for periphial speeds of 1.0, 0.65 and 0.40 feet per second respectively with the highest speed at the influent end. The drive shall be for outdoor all-weather operation, with a totally enclosed fan cooled 440 volt, 3 phase electric motor of ample power to provide the maximum torque requirements for continuous operation, and furnished with starters.

(f) Starters: Starters furnished for floculator drives shall be 208 volt, 3 phase combination air circuit breaker type, full voltage starters in watertight case, with inter-connected oil-tight push-button station located at drive unit, and with provision for connection to similar remote push-button with associated red-run light. The remote push-button station is to be located in the chemical feed room.

(g) Materials: Size and thickness of shaft and thickness of paddle blades are minimum and shall be increased if required by the manufacturer for proper operation of equipment.

(h) Painting: All steel work shall be thoroughly cleaned and scaled in the shop and shall be given one shop coat of Inertol 621. Field painting shall consist of one (1) field prime coat of Inertol 621, and three (3) finish coats of Inertol No. 49 thick.

(i) Manufacture: The flocculator mechanisms, complete with motor and starter shall be furnished by the manufacturer of the flash mixer, and shall be furnished as manufactured by Dorr Co., Walker Process Co., or American Well Works Co.

(j) Drawings: The Contractor shall submit five (5) copies of drawings and specifications covering the equipment to be furnished, in detail for checking and approval by the Engineer. No fabrication or manufacture shall commence until such drawings and specifications have been approved.

(k) Service: The Contractor shall furnish the services of a representative of the manufacturer of the flash mixer and flocculation equipment whose duty it shall be to check installation, initial operation and testing of equipment.

9.44 General Description of Sludge Collector Equipment:

(a) Manufacture: The collector equipment shall be as manufactured by Dorr Company, Eimco or Walker Process.

(b) Size: The collectors shall be designed to effectively clean two tanks 40 feet wide with a side water depth of approximately 12'-0". The collector shall be of the flow through type with a central driving mechanism and center cage with two rake arms. Scraping blades that can be adjusted 1-1/2" vertically shall be arranged to move sludge to a pocket located at the center of the tank. Corner raking bars shall be provided as specified herein. Collecting speed shall be 2 revolutions per hour.

9.45 Center Drive Mechanism: The center drive mechanism shall consist of a

turntable base, an internal gear and pinion and shall be so designed that the balls and strip levers can be removed without removing the walkway.

The turntable base shall be bolted to the concrete center column, shall be a high-test 40,000 psi Mechanite metal casting and shall be designed to support ehe internal gear with the rotating mechanism and the walkway. The top of the turntable base shall be designed to form a platform to provide convenient access to the drive mechanism. The turntable base shall have an annular raceway for a ball race upon which the internal gear rotates. The ball race shall have diameter of at least 65 inches to assure stability without the necessity of guide shoes and shall use large diameter alloy steel balls, which shall bear vertically and horizontally on four renewable special hardened steel liner strips inserted in the turntable base and internal gear. The balls shall run in an oil bath which shall be protected by a felt seal and a steel dust shield.

The internal gear shall be a high-test 40,000 psi Mechanite metal casting and shall be designed to support the center cage and rake arms. The internal gear shall be driven by a heat treated Mechanite metal pinion and shaft keyed to the drive unit worm gear. The center drive mechanism shall develop a minimum torque of 33,000 foot-pounds and the clarifier shall be designed for this torque.

9.46 Drive Unit: The drive unit shall consist of a gear reduction unit driven by a 1,800 rpm TEFC, 55° C, 3/4 H.P. motor, driving the collector by chain and sprocket drive with guard through a worm gear unit. The worm gear shall be keyed to the drive pinion shaft. Thrust of the worm shaft shall be taken by a ball thrust bearing retained by a compression spring and set for operating an overload device. The gear reduction unit shall be of the helical gear type of Falk or equal quality and efficiency, with roller or ball bearings, and shall conform to standards of the American Gear Manufacturers Association for Class II rating and carry a AGA nameplate. It shall be rated for a service factor of 1.25 for 24 hours uniform loading or 10 hour moderate shock loading.

9.47 Electrical Controls: The drive motor shall be furnished with a start-stop, momentary contact push button located on the handrail near the motor. An overload device actuated by thrust from the worm gear shaft shall actuate an alarm located in the control console in the main building.

The overload device shall have a pointer to indicate the load on the mechanism at all times. The overload device shall have two mercury switches so adjusted that an alarm signal sounds when the load on the mechanism approaches an overload, and to open the motor circuit when an excessive overload occurs. The overload device shall be enclosed in a separate weatherproof NEMA IV cast iron housing suitably mounted on the collector.

9.48 Walkway and Center Cage: The walkway shall extend from the tank side to the center of the collector and shall be fabricated of 20.7 - 12-inch structural channels. The walk shall be of 1-1/2" solid plank Borden banded aluminum grating supported by angles welded to the channel supports with suitable clips. The channels shall be braced with angle bracing to provide an l/r ratio of 120 or less. Bracing shall have a maximum l/r ratio of 200. The walkway shall be 3'-0" wide and shall have hand rails secured to posts mounted on the outside of the channels. Handrail shall be as shown on the plans and identical to handrail on the settling basin walks. Similar handrail shall also be provided around the center platform. The steel center cage shall be hung from the internal gear and shall be sufficiently strong and stiff to support and rotate the rake arms.

9.49 Rotating Arms: Two structural steel arms of box truss construction conforming to the tank bottom slope shall be provided. The arms shall be rigidly connected to the center cage and shall be provided with steel adjustable blades for moving the settled sludge along the tank bottom to the sludge pocket. Tie rods shall not be used for the trussed rake arms. The blade setting shall be identical for each arm with the blades so spaced that the entire circular portion of the tank can be raked twice for each revolution of the mechanism. The rake blades shall have a minimum length of 10'. Furnish and install necessary adjustable spring brass squeegees for all blades. The squeegees shall be mounted on the steel blades by bolts and be adjustable a maximum height of 1-1/2". The lowest position of the squeegees shall come within 1/2" of the finished floor at its highest point.

9.50 Corner Blade Mechanism: There shall be furnished and installed in the settling basin a 1/4" guide plate not less than 6" high and anchored to the settling basin wall fillet corners and concrete floor in such a manner to form a square with radial corners.

To the extremity of the rotating rake arms previously called for, there shall be attached a corner blade mechanism arranged to effectively remove the settled sludge in the corners of the tank. Each corner blade mechanism shall consist of two parallel linkage frames of welded steel pipe construction, with the outer ends supporting a pivoted corner blade and the inner ends pivoted to the support frames on the end of the rake arm. The pivots shall be steel rotating in Micarta bushings that can be renewed readily. The outer end of the corner blade shall be provided with a Micarta wearing block. Each mechanism shall be actuated by stainless steel cable guided over a pocket sheave and provided with suitable weights to keep the guide block on the end of the corner blade in contact with guide plate at all times. The construction of the corner blade mechanism shall be pipe construction in order to add buoyancy. The corner blades and minimum setting shall be of same type as called for the arm blades. Use only one corner blade per arm.

(a) Erection: The Contractor shall erect the clarifier mechanism in accordance with the recommendations of the manufacturer. The Contractor shall furnish the necessary oil and grease for the initial 30-day operation, using oil and grease as recommended by the manufacturer.

(b) Painting: All shop and field painting shall be done in accordance with paint specifications.

9.51 Filter Media: Anthracite filter media shall be used for the top 12 inches of media in the existing filters. The Contractor shall remove the existing media to elevation 91.0 and replace with the anthracite media.

Filters shall be taken out of service one at a time, the media changed and the filter sterilized and placed back in service. During removal of the existing sand and replacement of media especial care shall be taken to prevent contamination by foreign matter that will be difficult to remove, such as paper, sticks, cinders, etc.

Anthracite media shall have an effective size of from 0.95 to 1.0 mm with uniformity coefficient not to exceed 1.35.

All filter media shall be free from organic matter. Media shall be tested for solubility in dilute acid and shall be 95% insoluble in cold dilute sulfuric

acid. Anthracite media shall be composed of hard durable grains with average specific gravity of from 1.50 to 1.56.

In placing the media, Contractor shall mark off on one of the four walls of each filter the levels called for; then by means of controlled water levels at these marks place the media. Chutes for placing the media are permitted provided a landing board 4' x 4' is placed under the end of the chutes. The finished filter shall then be given at least three washes and the sand surface level checked for proper depth below the filter trough. Adjustments shall be made by the Contractor to each filter sand bed at the end of the 30-day operating or maintenance period.

9.52 Filter Surface Wash: Surface wash assemblies for each filter shall be furnished and installed. Each filter is 18' x 20'. Each cell will require four surface wash assemblies approximately 8'-6" overall diameter.

(a) Filter Sweeps: The filter sweeps shall be standard Type TJ as manufactured by F. B. Leopold Company, Inc. or the equivalent type manufactured by Palmer Filter Equipment Company. All piping for the arms and nozzles shall be constructed of bronze. The main supply pipe to each filter sweet shall be 2" brass pipe of suitable length to place the filter sweeps above the sand, and shall connect to the filter sweep headers. Butterfly valves on filter sweeps shall have adjustable valve stops.

9.53 Horizontal Pump Requirements: The following pump characteristics and materials are required for horizontal pumping units except that materials of similar characteristics but slightly different composition may be substituted if listed in the Proposal.

(a)	Number Required	2	1
(b)	Design Capacity (GPM)	10,500	6,300
(c)	Maximum Operating Head (ft.)	312	312
(d)	Design Head (ft.)	295	285
(e)	Minimum Operating Head (ft.)	270	250
(f)	NPSH Available at Design	18	18
(g)	NPSH Available at Minimum Head (ft.)	23	23
(h)	Maximum Shut-off Head (ft.)*	360	360
(i)	Number of Stages	1	1
(j)	Required Discharge at Max. Head	8,400	5,600
(k)	Minimum Pump Efficiency (%) at Design	87	86
(l)	Min. Efficiency Max. to Min. Head	80	80
(m)	Minimum Horsepower Motor	1,000	600
(n)	Maximum Locked Rotor Amps at 2,300 volts	1,340	850
(o)	Maximum RPM	1,180	1,780
(p)	Overload Capacity	Maximum pump HP continuous	
(q)	Maximum Temperature Rise at Nameplate	60°	60°
(r)	Shaft Material	Steel - ASTM A-107 Grade 1045	
(s)	Shaft Sleeves	Bronze - ASTM B-147	
(t)	Impeller	Bronze - ASTM B-143, Class 1-A	
(u)	Wearing Rings	Bronze - ASTM B-147-49	
(v)	Casing	Cast Iron - ASTM A-48 Class 30, Dual Volute	

*Higher shut-off heads are allowable if 250 lb. discharge flange and 250 lb. ball valves are furnished. Shut-off head shall not exceed 430 feet in any case.

9.54 Horizontal Pump Details: Each pumping unit shall be of the double suction type with horizontally split casing, shaft sleeve, impeller and casing wearing rings. The pump motor assembly shall be mounted on a fabricated steel base, connected by flexible shaft couplings. Each part of the pumping unit shall be as follows:

(a) Casing: The pump casings shall be horizontally split with flanges machined to a true flat surface. The casing halves shall be doweled for proper alignment. The casing shall have vent connections at high points suitable for piping to a central location for priming. A gauge tap shall be furnished at the suction and discharge flange of each pump. Flanges shall be A.S.A. 125 psi. The casing shall be finished and provided with lifting rings, each pump shall be provided with a casing drain.

(b) Impeller: The impeller shall be of the enclosed type, of one piece construction; interior and exterior surfaces shall be finished smooth. All interior surfaces shall be hand finished. Hubs shall be bored and key seated accurately, and machined for securing on the shaft with a straight fit. Patching of blow holes or other imperfections in the impeller casting will not be permitted.

(c) Bearings: Furnish sleeve type bearings. The bearings shall be oil lubricated with oil level indicators and oil reservoir. The brackets supporting the bearing housings shall form a drip pocket for collecting stuffing box leakage. These drip pockets shall have tapped drain connections. Sleeve bearings shall be babbit lined oil ring type. Split along the shaft centerline with bronze removable split type oil ring.

Provide water slingers and aluminum spray guards.

(d) Stuffing Boxes: The pumps shall be equipped with conventional 3/4-inch square packing, plus a seal ring. External water from the system shall be keyed to each stuffing box thru a pressure reducing valve set to reduce the pressure of the seal water from 10-20 # psi and provided with 3" dia. gage, graduated 0-30 #. Furnish gage cock and snubber for each stuffing box. Stuffing box glands shall be bronze, split type with bronze swing bolts and leak off hole.

(e) Shafts and Shaft Sleeves: The impeller shall be mounted on the shaft with straight fit and key. Shaft sleeves shall be attached to the shaft either by threads at the impeller hubs, or with internal impeller nut, external shaft sleeve nut and separate key. Shaft sleeves shall be sealed against leakage with rubber "O" rings. The shaft shall be tapered for coupling removal.

(f) Wearing Rings: The pumping units shall have both casing and impeller wearing rings. Wearing rings shall be L nozzle, intermeshing or labyrinth type; flat rings will not be acceptable. The casing ring shall be of tongue and groove type and the impeller rings screwed and/or pinned to the impeller.

(g) Couplings: Flexible couplings of the metal to metal type shall be furnished between each unit. The couplings shall be either gear type or fast couplings. Couplings adjoining the motor shall be of the limited end float type.

(h) Bedplate: The pump motor assembly shall be mounted on a fabricated steel bedplate, consisting of steel shapes welded to steel plates, all welded joints shall be ground smooth. The pumps and motor shall rest on machined mounting pads. The upper surface of the bedplate shall be furnished with a drip lip and drain. Drain lines from drip pockets shall terminate at the drain connection. The pump shall be assembled prior to shipment, but may be shipped disassembled. The pump manufacturer shall furnish cadmium plated anchor bolts.

(i) Small Piping: Small piping for priming, seals and drains shall be furnished by the pump manufacturer, and shall be rigid copper pipe Type K with solder joint fittings. All piping shall be completely fabricated, but may be removed for shipment. Minimum size piping shall be 3/4-inch O.D. Drain lines from drip pockets shall be piped to the nearest floor drain.

9.55 Check Valve Operation: A ball check valve will be furnished on the pump discharge. This valve will open automatically in approximately 90 seconds, beginning when the pump discharge pressure reaches 200 feet of head. The valve will close prior to stopping the pump except on power failure when the pump will lose power 90 seconds prior to full valve closure. The pumping unit assembly and electric motor shall be designed to run at terminal reverse speed caused by 300 feet of head on the pump discharge.

9.56 Starting Capacity: The thermal capacity of the starting windings on the synchronous motors shall permit two consecutive starts and then a third start after five minutes, but it is not required that this cycle be repeated until the winding has cooled to ambient temperature.

9.57 Electric Motor Details: The induction motors shall have Class "B" insulation and be rated for an ambient temperature of 40° C., 800 feet above sea level, 60° C. temperature rise. It shall conform to the latest NEMA Standards, ASA Standards for Rotating Machinery and the A.I.E.E. Test Code for Induction Motors. The motor bearings shall be split sleeve type with split end shields with easily observable oil rings. The minimum end float of the shaft between shoulders shall be not less than 1/2 inch to accommodate the limited and float couplings specified on the pumps. One bearing shall be insulated to prevent shaft currents. All bearing housings shall provide an ample oil reservoir, afford easy removal and replacement of bearings and oil fitting without spilling. The oil level gauges shall be designed and located to provide for easy and accurate reading. All bearings shall be suitable for 300 SSU viscosity oil at 100 degrees F. The motor manufacturer shall install the half coupling which the pump manufacturer will furnish to him. Terminal boxes shall be large enough to accommodate cables from below and connecting cables to lightning arresters and protective capacitors also below. All motors shall be guaranteed to have an operating noise level that does not exceed 90 decibels. Minimum motor efficienty shall be 93%.

The motors shall be furnished with a box type enclosure and furnished with strip heaters and bearing temperature gauges. Terminals shall be suitable for NEC size 85° insulated rubber conductors, two per phase, and for excitation wiring. Provide terminals for 3-2/0 arrester wires. Motors shall be as manufactured by General Electric, Westinghouse or Allis-Chalmers, or approved equal.

9.58 Controllers: Furnish and install high voltage controllers for the high service pumping station. The control center shall consist of the following equipment:

One Set - Incoming Terminals

One - 600 Amp. Horizontal Bus

One - Potential Transformer Compartment, containing:

- Two - 4160 - 120 volt potential transformers
- four - Current limiting HV fuses

One - Voltmeter and Transfer Switch

One - Transformer Feeder with 3 CLF Fuses

Three - Full Voltage Starters, each containing the following devices:

- One - Draw out assembly, externally operated consisting of:
  - 1 Set - Current limiting fuses
  - 1 - Air break 3 pole contactor
- One - Control Power Transformer (230 volt secondary) with primary fuses, of capacity to handle contactor, motor heaters and associated relays
- One - Control Power Transformer (230/120 volts for valve relays) Note: The 230/120 volt transformer may be omitted if a 2,400/120 volt transformer is used.
- Two - Current Transformers
- Two - Thermal Overload Relays, Temperature Compensated, Manual Reset
- One - Instantaneous Under Voltage Relay
- One - Time Delay Relay adjustable 1 to 5 minutes to prevent successive re-starts
- One - Set of Relays and Interlocks for proper operation of associated check valve and vacuum priming system
- One - Set of Terminals for plug in of test instruments
- One - Ammeter, flush mounted and associated C.T.'s
- One - Elapsed Time Meter
- One - START-STOP push button with RED, GREEN, and AMBER lights and terminals for duplicate push button station with RED, GREEN and AMBER run lights on remote control console

All starters shall be of the same general construction, front connected, with roll out air break contactors, and with incoming cables, motor leads and control wiring from below.

(a) Enclosure: The starter for each motor shall be furnished complete, with all internal wiring connected to properly labeled terminals in a rigid, free standing, self ventilated NEMA Type 1 metal enclosure, divided into high and low voltage compartments. Doors shall be of rigid, non-warping construction with sturdy hinges to prevent sagging and permitting

greater than 90 degree swing. Door handles shall be provided with locks. The HV door shall be interlocked with the contactor to prevent door to be opened with the contactor closed or to close contactor with door open. The manufacturer shall effectively electrically bond all parts of the enclosure and its barriers together and provide ground connection bolts for connection to the grounding system. Provide solderless connectors for all power and control wiring. Construction shall be such that the units will require grouting in place. Provide removable lifting angles.

(b) Isolating Device: The removal of contactors from operating position shall disconnect the contactor and fuses from the power and control circuits. This shall also close shutters to prevent body contact with live parts in the HV contactor compartment.

(c) Associated Devices: The following devices are associated with the high voltage starters but are not contained therein, and shall be furnished under this contract unless otherwise specified.

Three - Sets of Check Valve Controls.
At Pump, by valve manufacturer.

Three - Priming System Limit Switches.
At Pump.

Three - START-STOP Push Button Station with RED run lights.
At the control console.

Two - 400/5 through type current transformers for mounting in an expanded aluminum enclosure suspended from ceiling below starters. The raceway for the incoming service cables shall connect to the enclosure for the current transformers. These current transformers shall be G.E. Type JCP-0, Catalog #822 x 64 or approved equal. Window in CTs shall be of sufficient size for two (2) cables per phase.

9.59 Lightning Arrestors and Protective Capacitors: Furnish lightning arresters of the station valve type and capacitors of 0.5 microfasads per pole. This equipment shall be suitable for mounting in an aluminum framework below the motors.

9.60 Ball Check Valves: Furnish and install metal seated ball valves for pump check service for seating in both directions imilar and equal to Willamette List 26, with monel-stainless seats. Valves shall be for 360 feet head service. The pump manufacturer may elect to use a shutoff head in excess of 360 feet in which case the valve shall be designed for pump shutoff and the pump manufacturer shall bear the additional expense. Valve operators shall be hydraulic cylinder type with Greer accumulator. All throttling for opening and closing periods shal be done on the discharge side of the cylinder. Only electrical type solenoid valves shall be employed for the normal opening and closing periods. The normal opening period shall be not less than 20 seconds, but which can be adjusted to give

maximum opening period of 60 seconds. The normal closing period shall be designed to operate between 60 and 300 seconds. The actual settings shall be made in the field. Power failure shall cause the valve to close within 20 to 30 seconds. All control parts in contact with the water being used shall be constructed of stainless steel or bronze. The necessary normal and emergency solenoid valves of proper sizes shall be furnished by the valve manufacturer. Solenoids shall be for 220 volt service.

(a) Manual Control: The valve shall be equipped to open or close manually irrespective of the electric control system.

(b) Limit Switch: An overrunning limit switch shall be furnished and mounted on the valve mechanism cover. The purpose of this switch shall be to shut down the pump motor when the valve is nearly (at least 90%) closed. The switch shall be reset when the valve is closed and shall not trip on valve opening.

(c) Pressure Switch: The pressure switch for automatic opening of the valve shall be standard Mercoid Switch DA-31 Type, suitable to close when pressures reach 60 lbs. Maximum pressure shall be 200 lbs. The pressure switch will be connected to the pump discharge.

(d) Hydraulic Accumulator: Greer hydraulic accumulators 300 psi series of sufficient capacity for at least 2 strokes shall be furnished for the operation of each check valve. The Greer Accumulators shall be as manufactured by Greer Hydraulics, Inc., 454 - 18th Street, Brooklyn 15, New York. The Contractor shall furnish the necessary hydraulic piping, valve, check valve and pressure regulating valve for the Greer accumulators, from the high service discharge pipe to the accumulators and check valve control system.

(e) Electrical Controls: The valve and motor controls shall perform the following functions:

The start push button shall cause a relay to operate which seals in the push button and makes the circuit through a normally closed limit switch. This causes a relay to operate the motor contactor relay and seal in the first relay. A solenoid valve is connected in parallel with the start relay and in series with a pressure switch.

On normal stop the stop push button de-energizes the start relay and normal solenoid. The limit switch has sole control over the motor operation. Closing of the valve causes the limit switch to open momentarily stopping the motor.

On power failure or pressure failure the motor is stopped and cannot be re-started until a time delay relay is closed.

(f) Drawings for High Service Pumping Equipment: The electric motor control center manufacturer shall furnish complete wiring diagrams and outline drawings for the controllers within eight weeks of purchase. All low voltage wiring for remote connections shall be brought to terminal boards as shown on the wiring diagrams.

The pump manufacturer shall furnish drawings of the stage piping for approval. After approval, such piping shall be shipped, including bolts

and gaskets. The losses in stage piping shall be included in efficiency guarantees.

Schematic drawings of copper piping for priming seals and other devices shall be furnished for approval.

9.61 Pump Priming System: A constant prime pump priming system of the maintained vacuum type shall be furnished and installed for priming and maintaining prime on wash water pump, and the pumps to be furnished by the Owner. The system shall consist of the following:

(a) Air Release Connections: Each pump case shall have an air release connection at the highest points of the case, not less than 1-1/2" size for the high service pumps, and at the top of the case over each suction eye, not less than 1/4" size.

(b) Priming Chambers - Installation: Each pump shall be provided with a float operated priming chamber, mounted on the pump case air release connection, for controlling the release of air from the pump to the continuous vacuum priming system. Between the pump and the priming chamber shall be installed a gate cutoff valve. Between this gate cutoff valve and the pump shall be installed a connection, not less than 1/4" size, to the air release connection over each impeller suction eye. Each of these connections shall be fitted with a priming valve such that air will be released to the vacuum priming system, but high pressure water from the pump volute cannot be recirculated to the suction eyes.

(c) Priming Chambers - Construction: Priming chambers for the finished water units shall be 1-1/2" inlet and outlet connections. All parts, including the floats, shall be constructed to withstand the shutoff pressure of not less than 150 psi water working pressure. These priming chamber floats shall be of stainless steel construction, not less than 8" in diameter, shall be of the flute guided type, with float guide ribs operating vertically in guide bushings on the internal wall of the float chamber. These float chambers shall have tight shutoff air valves using a replaceable leather or soft composition material on the seat. Each of the priming chambers shall be equipped with an external pointer and target to indicate when the pump is under prime, and a switch to stop in case the pump is not primed.

(d) Vacuum and Drain Tank: The vacuum tank shall be installed with vertical axis, mounted on a ring base, and shall provide the support for the two vacuum pumps and the mounting for the two vacuum pump starters, the vacuum switches and the vacuum gauge. The tank shall be a two compartment combination vacuum and drain tank. Vacuum and drain tank shall be of such design and arrangement that the condensate can be drained from the drain tank to atmosphere without breaking the vacuum in the vacuum compartment.

(1) Tanks: Both compartments of the vacuum tank, vacuum and drain compartments, shall be hot dipped galvanized after fabrication, both internally and externally. Both compartments shall be constructed

with flanged and dished heads to withstand a collapsing pressure of 30" of mercury vacuum.

The vacuum tank section shall have a volume not less than 30 cubic feet and shall have tapped openings for pump priming, vacuum pumps, vacuum gauge, vacuum switches, water gauges and drain connections. The drain tank section of this two compartment tank shall have not less than 8 cubic feet of volume. It shall have tapped openings for drip from vacuum tank, vacuum equalizer, vacuum breaker, water gauge and drain connections.

(2) Vacuum Gauge: One vacuum gauge for the vacuum tank shall be bracket mounted on the tank, 6" dial, 0" - 30" of mercury calibration, flanged case, flanged ring, bronze bourdon tube. A second 8" dial gauge shall be wall mounted in the pump room.

(3) Vacuum Switches: Two vacuum switches for controlling the priming pumps from the vacuum tank, shall be mounted on the gauge bracket and control the operation of the vacuum pumps. Vacuum switches shall be of the mercury contact type with vacuum setting and range setting between ON and OFF externally adjustable.

(4) Water Gauges: Water gauge in the vacuum tank shall be not less than 18" C - C. Water gauge in the drain tank shall be not less than 15" C - C. Gauge glasses shall be 3/4" O.D. Water gauge cocks shall be of bronze, 3/4" size. Each water gauge shall have two brass water gauge protecting rods.

(e) Vacuum Pumps: Two vacuum pumps shall be furnished and installed on the mounting brackets as shown. These vacuum pumps shall be of the positive displacement water seal type, and shall be equipped with cutoff and regulating cock and solenoid valve on the seal water supply, such that when the vacuum pump is automatically started, the seal water will be applied. Each vacuum pump shall have a capacity for evacuating not less than 33 CFM from a 24" of mercury vacuum when operating at 1,750 RPM. Motors shall be mercury vacuum 3 H.P. minimum for 208 volts, 3 phase, 60 cycle power, rated at a 40° C. temperature rise based on a 40° C. ambient temperature. Each vacuum pump discharge shall be provided with a 1" discharge muffler, galvanized.

(f) Vacuum Pump Motor Starters: Each motor shall be provided with a combination magnetic motor starting switch with disconnecting breaker and thermo overload protection. Each starting switch shall be equipped with a hand-off-automatic pilot switch, and the control wiring shall be such that the vacuum pumps will be started and stopped from the vacuum in the vacuum tank, and the sequence of pump operation can be alternated mechanically.

Furnish combination starters with 3 coil overload protection for 208 volt operation in accordance with electrical specifications.

(g) Vacuum Pump Motor Starters are to be mounted on the unit. The pumps will be started and stopped from vacuum switches and furnished with an alternator.

(h) Operation: Operation of the priming system shall be such that not

less than 20" of mercury vacuum will be held at the priming valve of each pump. The pumps shall alternately cut-on at 22" of mercury vacuum and the second pump cut-on at 20" of mercury vacuum. Both shall stop at 24" of mercury vacuum.

9.62 Five Point Booster Pump: Furnish and install a dual driven horizontal double suction pump for the five points booster station. Installation shall be done during the winter season in order to provide minimum interference with water system operations. The pumping unit shall meet the specifications for high service pumps and shall have the following characteristics:

Design Capacity (gpm)	2,100
Design Head (ft.)	116
Maximum Operating Head (ft.)	142
Req. Capacity at Max. Head (gpm)	1,400
Minimum Operating Head (ft.)	100
NPSH available at Design (ft.)	23
NPSH available at Min. Head (ft.)	33
Max. Shutoff Head (ft.)	170
Min. Horsepower Motor	75
Max. Horsepower on Curve	85
Max. RPM	1,760
Efficiency Design (%)	84
Max. Locked Rotor Amps	1,080

The pumping unit is served by a pole mounted bank of 112.5 KVA, 230 volt, three phase transformers. The unit shall start and operate successfully using a 65% tap auto transformer starter. The pump motor shall be furnished with a 1.15 service factor, maximum temperature rise 60° C. by thermometer.

The pump is to be equipped with a natural gas engine of adequate size to drive the pump at rated capacity. The maximum rpm of the engine is to be 1,780 rpm.

The engine shall be designed for continuous duty at the horsepower required for operation of the pump at its maximum power requirement. In addition the engine shall be capable of operating at speeds of 10% in excess of design and horsepower 33% in excess of design for periods of two hours or less without damage to either unit. The minimum continuous engine shaft horsepower required shall include losses for clutch, shafting, pump, engine and engine accessories.

The manufacturer of pumping equipment shall supply the engine and be responsible for its initial operation and maintenance within the warranty period specified.

9.63 Five Points Pump Engine Details: The engine shall be 4 cycle, naturally aspirated, water cooled heavy duty, high speed type, designed to use natural gas as fuel. The engine shall be equal to those manufactured by Continental, Hercules, Waukesha, Cummins or Caterpillar. It shall develop sufficient power to drive the pump and accessories continuously under all specified conditions. Minimum engine displacement shall be 480 cubic inches.

The engine shall be provided with electric starting equipment and two 24 volt storage batteries, a charging alternator, a remote mounted exhaust silencer.

Cylinders shall be constructed of high-grade cast iron, bored and ground or honed to size. The cylinders may be cast all in one block. The cylinder head shall be removable.

Valves shall be of the poppet type, with intake valves of alloy steel, and exhaust valves and seats of Stellite, faced type, and the design shall be for positive rotation.

Pistons shall be made of high-grade metal, preferably hard, close grained cast iron, accurately turned and ground to size. Pistons shall be fitted to cylinder with tolerances proper for engine design, and shall have at least four rings each, best suited for low horsepower and variable speed.

Main bearings and connecting rod bearing shall be steel backed, babbit lined, securely doweled and locked in both case and cap, and must be of the replaceable type.

Cam shaft shall be heat treated, and accurately machined to size. Cams shall be forged with shaft and shall have four cam shaft bushings.

Connecting rods shall be forged steel. Wrist pins shall be either full floating or clamped in the connecting rods. Each wrist pin shall be provided with high-grade bronze bushings.

Timing gears shall be machine-cut helical, fitted accurately to the shaft.

Crank shaft shall be forged in one piece from steel and shall be machined and drilled for force feed lubrication. The crank shaft shall be statically and dynamically balanced to within 1/2-inch-ounce.

Flywheel shall be made of cast iron or steel, shall be balanced dynamically, and shall be marked to show valve timing.

Ignition system shall be high-tension type, or may be of the low-tension type with magneto, operated through a storage battery, coil, distributor and spark plugs. Timing of the engine shall be automatically controlled by the engine load and speed. Spark plugs shall be of the type best suited for natural gas engine operation.

Connect exhaust with flexible stainless steel tubing to silencer, equal to Maxim Type MUL. Flexible exhaust tubing shall be furnished to minimize vibration between engine and silencer which shall be mounted remotely. Provide expanded aluminum metal guard around exhaust stack to a point 7'-0" above floor.

Electric starter, alternator, regulator and ammeter shall be 24-volt, of a type best suited for performance and durability.

Mechanical governor shall be furnished to regulate the engine so that its speed will not exceed 1,780 RPM. The governor shall be designed to prevent excessive racing when the load is released suddenly or when the engine is operated under a reduced load. The governor shall be adjustable and shall operate with a minimum of springs, dash-pots, or similar devices.

Tachometer shall be provided to indicate revolutions per minute of the engine and to provide a record of the total time the engine operates. A dual drive is to be provided for driving the tachometer and automatic controls for positive contact.

The engine shall be provided with a positive forced-feed lubrication system to all main and connecting rod bearings. The system shall provide proper lubrication for all moving parts and shall include approved type filters. Provide dry type replaceable air cleaner.

The engine shall have a sheet metal enclosure of standard design with paint finish as specified for pumps.

Automatic choke shall operate by a solenoid to choke engine automatically when it is energized.

Control switches shall be included which close a circuit when lubricating oil pressure drops to 6 pounds or when water temperature reaches 190° Fahrenheit. Provide oil pressure gage and temperature gage.

Idle speed shall be 600 rpm.

Electric solenoid fuel valve shall be installed in the fuel line in the normally closed position and shall be 24 volt, D.C.

Engine control shall be automatic or manual, as described further in this section of Specifications.

The engine shall be cooled by a suitable closed circuit heat exchanger provided by the engine manufacturer, wall mounted. All materials in the cooling system in contact with the engine coolout shall be of non-ferrous materials. A thermostatic valve furnished by the engine manufacturer shall be placed in the cooling water supply line to regulate the amount of water flowing to the heat exchanger to maintain coolout to the engine at 180° F. The temperature sensing element shall be installed in the engine so as to maintain proper engine temperature. The thermostatic valve shall be suitable for 150 psi (normal operation will be at 30 psi). The surge tank shall have a readily visible sight glass gauge. Flexible connectors supplied by the engine manufacturer shall connect the engine coolant piping to the engine.

Furnish batteries, battery case or box for floor mounting, and battery cable to the engine. There shall be two batteries, each suitable for six successive engine starts, engine accessories, and outside accessories of approximately 2,000 watts. The batteries shall be 24 volt, each 24 month guarantee. The engine alternator shall be sized for the engine and approximately 2,000 watts additional load.

Furnish and install a centrifugal clutch for operation with the natural gas engine. The clutch shall be designed for operation at 1,750 rpm, transmitting approximately 75 horsepower and operation at 600 rpm, transmitting approximately 25 horsepower. The unit shall be Formsprang or approved equal with steel band on output member with input and output members dynamically balanced.

A trickle charger shall be furnished and installed where shown on the drawings. The trickle charger shall operate on 115 volt, single phase current, and shall be equipped with the necessary devices to prevent overcharging the batteries or damage to the charger when the engine is started.

9.64 Five Points Engine Controls: The engine shall be started by a local or remote operated manual electric starter. All engine controls and instruments shall be mounted on the engine. Furnish and install local and remote switch and

connect remote switch and run light to telemetering system.

9.65 Bogart Booster Station: Furnish and install two submersible, in-line booster pumps with the following characteristics:

Design Capacity (gpm)	350
Design Head (ft.)	80
Max. Operating Head (ft.)	95
Req. Capacity at Max. Head (ft.)	250
Min. Operating Head (ft.)	60
Min. H.P. Motor	15
R.P.M.	3,500
Max. H.P. on Curve	12
Efficiency at Design (%)	70
Stages	1

The pumping unit shall be of the water lubricated vertical turbine type conforming to specifications for flushing water pumps. The pump shall be furnished with 4-inch suction and discharge adopter and 8-inch casing, complete with booster lead, cable guard, pump centralizer, stainless steel screen, and coupling-cable seal. Suction and discharge shall be A.S.A., 125 lb. flanged. The casing assembly shall be painted with two coats of Inertol 620 Primer and two coats of Inertol, Thick Black or equal. Connections between suction adoptor and pump casing and between discharge adaptor and casing shall be flanged. The pump motor shall be submersible type for 230 volt service, with reduced voltage starting. Furnish and install lightning arrestor and protective capacitor as specified for high service pumps complete with aluminum enclosure.

9.66 Sample Pumps: Furnish and install sample pumps for the specified functions. The pumps shall be constructed with motor and impeller on a common shaft with mechanical seals. The pump shall be cast iron bronze fitted with enclosed impeller. Pump characteristics shall be as follows:

Description	Location	Head (ft.)	Disch. (gpm)	RPM	Min. H.P. Motor
Raw Water	Chem. Bldg.	30	10	1,750	.75
Treated Water	Chem. Bldg.	30	10	1,750	.75
Settled Water	Control Bldg.	25	10	1,750	.75
Filtered Water	Control Bldg.	40	10	1,750	.75
Finished Water	Control Bldg.	40	10	1,750	.75

9.67 Post Flash Mixer: Furnish and install a post flash mix mechanism consisting of vertical motor, reduction gear shafting and impeller as shown on the drawings of 7-1/2 H.P., capable of mixing 14,000 gpm of finished water.

SECTION NO. 10

ELECTRICAL WORK

10.01 Scope of Work: The work shall consist of furnishing and installing all controls, switches, panels and necessary electrical materials, equipment and labor necessary to completely wire, install and connect up all electrical equipment and fixtures in accordance with the plans and specifications. The Contractor shall be responsible for making a complete working installation conforming to best practice and he shall furnish and install all necessary items whether specifically called for in the specifications or not.

The capacities of various items of electrical equipment, horsepower of motors, wire sizes, etc., given in the specifications or shown on the drawings are obtained from sources believed reliable, but are not guaranteed. It will be the Contractor's responsibility to verify all motor loads from the manufacturer of the equipment he proposes to furnish and to make proper allowance therefor in his Bid. Motors of larger horsepower than given in the tabulations or drawings may be used only after specific approval by the Engineer, after complete data has been submitted. All expense for increased sizes of wiring, starters, branch and main breakers, and other electrical equipment shall be borne by the Contractor without claim for extra cost.

10.02 Requirements: The latest regulations and standards of the National Electric Code, the National Electric Safety Code, the American Institute of Electrical Engineers, the American Standards Association and the National Electric Manufacturers' Association shall be considered as included in these specifications and all requirements shall be fully met. Any requirements or regulations and standards of local electric codes shall also be fully met.

10.03 Guarantee and Tests: The Contractor shall guarantee to make good any defects in material or workmanship which may develop in his work within one year from date of acceptance of the work. The installation shall be entirely free from improper grounds, short circuits, or other defects. All wiring shall have a dielectric strength between conductors and between conduits and ground of not less than the value recommended in the National Electric Code. All tests shall be made in the presence of the Engineer or his authorized representative. The Contractor shall furnish assistance in performing these tests as required by the Engineer.

10.04 Approval of Equipment and Materials: Before commencing any construction work the Contractor shall submit to the Engineer for approval, six (6) sets of manufacturer's descriptions, dimension drawings and schematic internal connections of all equipment he proposes to install. He shall also provide manufacturers names, catalogue number and adequate description of characteristics of all small devices, where this is necessary to understand its operation or its adequacy to the function it is to fulfill. Approval must be obtained before proceeding with construction or installation. Any materials or equipment delivered to the site prior to approval of drawings or lists of equipment will be at the Contractor's risk. All electrical materials shall be new and where listed by the Underwriters' Laboratories, Inc., shall meet its requirements and shall bear its label.

10.05 Grounding: The intent of these specifications is to insure that for

every location where there are power or lighting neutrals, cabinets, conduits, motor frames or parts of other devices that are required by N. E. C. to be grounded that there shall be a copper connection to a copper or copper weld electrode which reaches below the permanent moisture line. A #00 bare copper cable shall be extended to the lowest point of excavation for the structure and thence a minimum of 30 feet around the low portion of the excavation. Permanently bonded to the ground wire shall be #00 bare copper risers which shall enter the building. The #00 bare copper ground risers shall be extended as necessary to enable all of the aforementioned electrical equipment and devices to be permanently bonded to the grounding system. In general, #4 copper wire will be adequate for grounding of individual equipment. At terminations of grounding systems at transformer banks, provisions shall be made as will enable the Owner to make connections for proper grounding of the transformer banks.

10.06 Miscellaneous Materials and Equipment:

(a) Underground circuits shall be in galvanized genuine wrought iron conduit, installed in accordance with manufacturer's instructions. Where conduit passes through concrete walls or slabs, use O-Z Manufacturing Company type "WSK" or "FSK" watertight entrance fittings. Care must be exercised to insure that conduit will not settle but remain in straight lines and must be covered with at least 24" of soil. Diameter shall be ample for size of cables specified.

(b) Pull boxes of 1/4" thick sheet steel, galvanized after fabrication, shall be installed at such locations as may be necessary to facilitate pulling in the conductors without undue tension, with proper allowances for pulling around bends. Covers shall be bolt-down, gasketed type. Set with minimum of 4-inches of concrete, 4 sides and bottom.

(c) All conduit installed in concrete or interior of buildings shall be galvanized rigid steel conduit, shall be made by the electric galvanizing or hot-dipping process. Flexible conduit, where required for connections, shall be U. L. Standard, with prefabricated breaking lines. Rigid aluminum conduit may be used in 2" size and larger. Where conduit runs in concrete cross building expansion joints, O. Z. Manufacturing Company type "DX" expansion and deflection fittings shall be used.

(d) Structural steel shapes and plates shall be galvanized in accordance with A.S.T.M. Publication A-123.

(e) Wall Receptacles: Receptacles, except where otherwise indicated on drawings, shall be of the duplex type rated at 15 amperes, 125 volts, Hubbel #5252 or explosion proof as indicated. Where receptacles are indicated of a capacity greater than 10 amperes, such receptacles shall be of the single type having capacity to carry their rated load continuously without damage. Each such receptacle shall be provided with armored cap with cord grip and shall be provided with separate pole for grounding purposes. All receptacles shall be mounted 48 inches above the finished floor unless otherwise noted on the plans.

(f) Outlets: The location of outlets as shown on the various drawings shall be considered as approximate only. It shall be incumbent upon the Contractor to study all plans with relation to spaces surrounding each outlet in order that his work may fit the work of others and that when

fixtures or other fittings are installed they will be symmetrically located if possible, and will best suit each condition.

(g) Wall Switches: Wall switches shall be A. C. rated switch type. Operating handle shall be constructed of brown phenolic compound. Single pole, double pole or 3-way switches shall be rated 15 ampere, 120 volt, similar to Hubbel #1201, except where otherwise noted. All switches shall be suitable for the control of lamp loads shown on the drawings and shall carry the marking of the Underwriters' Laboratories, Inc. All switches shall be mounted 48 inches above the finished floor unless otherwise noted on the plans. Where two or more switches are mounted together, they shall be installed in gang condulets, with guarded type switch plated.

(h) Lighting Fixtures: Lighting fixtures shall be furnished and installed in accordance with the schedule and as indicated on the drawings. All lamp bulbs shall be furnished by the Contractor. Furnish all necessary wiring and conduits from the light panels to various fixtures and switches shown on the drawings. Manufacturers' names and model numbers are used for identification as to type and quality required. Competitive units may be offered if desired, but shall be accompanied by complete catalog data and a statement regarding any deviation from the fixture listed in the schedule.

10.07 Wire and Cable: All power and lighting circuits shall be of stranded coated copper except that size No. 10 and below may be solid. Sizes of power and lighting circuits are indicated on the drawings, but no such circuits shall be less than No. 12, except for control circuits which may be No. 14.

Minimum wire sizes shall be exceeded wherever necessary to avoid voltage drop in excess of 2%. Motor H. P. shall be verified from each manufacturer and wire sizes increased for larger motors than given on the diagram at the Contractor's expense.

Control cable shall consist of 7-stranded coated copper with 3/64 inches of color coded thermo-plastic insulation around each conductor, a reinforcing tape over assembled conductors and an overall tough plastic jacket in accordance with Specification A.S.T.M. D-734 and General Electric Specification SI-58173 or approved equal. Wherever splices are necessary in control cables or power cables, watertight junction boxes with screw terminals shall be used.

At the end of long runs on feeders and motor branch circuits and in all pull boxes and manholes, conductors shall be tagged or otherwise labeled to identify conductors.

(a) Low Voltage Wire and Cable, 480 V. and Below: Power and light cables for 480 volt service and below shall be single conductor stranded coated copper insulated with 75 degree, 600 volt rubber with an overall neoprene jacket, Type RHW, G. E. Specification SI-58020, or approved equal.

(b) High Voltage Cable, 2,400 V. Circuits: Power service for 2,400 volt circuits shall be single conductor stranded coat copper with ozone and corona resisting 85 degrees, 5 KV, rubber insulation with an overall neoprene jacket, G. E. Specification SI-58020, or approved equal.

Connection to bus bars, motor terminals, etc. shall be made in accordance

Connection to bus bars, motor terminals, etc. shall be made in accordance with printed instructions of the cable manufacturers.

(c) Remote Control Cable: Cable for remote control of number one and two pumps and for chlorine control circuits shall consist of fully color coded twisted pairs of No. 19 soft drawn copper with polyethelene insulation capable of withstanding 3,500 volts RMS test between conductors and between conductors and shield. Provide with a non-hydroscopic binder, 0.002 copper tape shield and overall polyvinyl chloride jacket. Cable shall be Type 150 as manufactured by the Plastic Wire and Cable Corporation or approved equal.

Cable carried on pole lines shall be supported on messenger wires and supports according to A. T. & T. standards. The cable shall be run continuously, with no joints or splices, between terminal points. At terminal points the cable shiled shall be separately and effectively grounded to the specified grounding system. At each end of the remote control cable, install on each pair of conductors a 2 pole indoor type protector and arrester unit with adjustable saw tooth discharge plate, carbons and ceramic fuses, properly grounded to the grounding system. Protector and arrester units with accessories shall be as manufactured by the Reliable Electric Company or approved equal.

All remote control cable will be furnished by the Owner. All cable to be installed on pole lines will be hung by the Owner. The Contractor shall extend the control cable with its messenger wire to suitable overhead anchorage on the roof of the building. The control cable will enter through a weatherhead and in conduit to the lightning arresters. The Contractor shall furnish and install the lightning arresters located in the low voltage control center. The Contractor shall extend control wiring to the respective controls.

The Owner will leave a sufficient length of cable at each terminal pole that cable may be extended to respective terminals within building without splices or junctions. The Contractor shall furnish and install all necessary terminal boxes, protector and arrester units, conduit, weatherheads, and all other necessary items for a complete and operative system.

10.08 Wiring: All wiring shall be installed in accordance with the provisions of the N. E. Code. Wiring, except where otherwise noted, shall be in rigid conduit of the type specified heretofore. Sizes shall be as required by the N. E. Code for the wire types specified or greater, if so called for on the drawings or herein.

All distribution of power and light circuits to the various items of equipment, fixtures, meters, control devices and other panels shall be made to form the bottom of the control centers and shall be run concealed or exposed in accordance with the following:

All conduit for 3-phase power shall be run concealed above the entrance floor level and shall be run exposed below. No exposed conduit shall be clamped direct to walls, beams or slabs. Clamps, hangers or supports for conduit shall provide a minimum clearance of 3/4 inch between conduit and walls, beams or slabs. All conduit for single phase lighting and small power shall be run concealed throughout the structure.

10.09 Incoming Services: The Owner will furnish 2,300 volt and 208 volt service for the raw water intake and 2,300 volt service for the high service pumping station. Service from the weatherhead to the respective control centers shall be furnished by the Contractor. Service for the five points booster station is existing service for the Bogart booster station will be 208 volt service furnished by the local REA cooperative.

10.10 Raw Water Intake Work: The 2,300 volt controls shall be furnished under pumping equipment. 240 volt controls will be furnished under this specification. High voltage equipment will be as follows:

(a) Furnished by Pumping Equipment Manufacturer:

One - Set of relays and interlocks for proper operation of associated check valves.

One - Interlock for solenoid oiler.

One - START-STOP push button with RED run light.

One - Set of terminals for remote SAFE-STOP-JOG selector switch mounted on motor frame.

One - Set of terminals for connection of lightning arresters.

One - Interlock for chlorination solenoid.

One - Set of terminals for remote STOP-START push buttons.

(b) Remote from Control Center, furnished by Contractor:

Four - G. E. type HGA low pickup auxiliary relays with 120 volt coils to operate at 60% to 100% of full voltage, located in low voltage control center.

Two - 220 volt coils and 110 volt contactors to operate a run light in the monitoring console, located in low voltage control center.

Two - SAFE-STOP-RUN stations mounted on a 3-inch channel near the raw water pump motors.

Other limit switches, pressure switches and relays as required for the complete operation and as shown on the drawings.

10.11 Low Voltage Control Center, General Requirements: The motor control center, hereinafter described in detail as to the equipment contained, shall be furnished and installed in the locations indicated on the drawings and in accordance with the one line diagrams which indicate the motors and circuits controlled. There are also included some schematic control diagrams which in some cases apply to more than one control center, but which are intended to show typical arrangements of interlocks, push buttons, selector switches, etc., to obtain the desired sequence of operation. The Contractor shall be responsible for supplying different manufacturers with coordinating data so that the correct heater elements will be supplied in starters and the terminal designations are

such that interconnections between terminals in separate cabinets will be unmistakably clear.

All control centers shall be of the same manufacture to simplify the maintenance of supply parts and facilitate the familiarity of the operators with every equipment. Motor control centers shall be the equivalent of those manufactured by General Electric, Square D or Westinghouse.

(a) The power supply will be 240 volts, 3 phase, 60 cycles. Certain starters will have 240 volt coils, but certain others will be operated on a 110 volt control circuit. Refer to diagrammatic and schematic diagrams.

(b) The control center shall consist of vertical sections 20" wide, 20" or 13" deep as indicated in drawings and 90" high. Each section shall be so constructed as to be free standing and rigid to insure that all openings will retain their original shape and that doors will always fit snugly. There shall be a horizontal insulation isolated 600 ampere bus extending the length of the designated number of sections and braced to stand a 25,000 ampere, 3 phase short circuit, unless otherwise specified.

Each vertical section shall likewise contain an insulation isolated 300 ampere, 3 phase bus of like strength, with minimum openings in the barrier for the stab connections of starter and feeder breaker units. When back to back construction is not called for there shall be two rear doors per vertical section. Master terminal compartments with removable covers shall be provided at the top and bottom and ample room allowed for all incoming and outgoing power and control wires. There shall be an isolated compartment for each section and a ground bus. Class II, Type C NEMA 1A gasketed construction is required with complete dimension, wiring and schematic drawings or sketches.

(c) There shall be separate compartments with sturdy close fitting gasketed doors for each starter, feeder or other unit and each unit shall be easily removable with a screw type mechanism which will disconnect the breaker from the bus and the control wires from the control wiring trough. Compartment doors shall be interlocked so that they cannot be opened when the breaker is closed unless a "defeater" mechanism is operated. The breaker operating handle shall clearly indicate the ON, OFF or tripped position.

(d) Molded case air circuit breakers shall be TPST manually operated, trip free, calibrated for 50° C and selected for a 40° C external ambient, and shall be provided with time delay thermal overload and magnetic overcurrent protection, for 25,000 amp I.C. or as indicated.

(e) Starters shall be of the FVNR combination circuit breaker type magnetic starter with overload and under voltage protection, reset buttons and such other interlocks, push buttons, selector switches and indicating lights as may be specified. All push buttons and selector switches shall be of the oil tight variety.

(f) Engraved lamacoid (white letters on black) name plates shall identify each device with the designation indicated on drawings.

(g) All breakers, starters, push buttons, selector and safety switches shall be of one manufacturer to facilitate maintenance and repair.

(h) Finish: Each control center structure shall be thoroughly cleaned inside and out to be freed of any oil after fabrication. It shall then be given a metal primer coat and two finish coats of ASA No. 49 gray. Sufficient paint for field touch-up shall be furnished. Just before shipment each control center shall be covered with a plastic covering in order to leave equipment with a newly-finished appearance after installation. Do not furnish strippable spray plastic coating.

(i) All control centers shall be installed on a concrete curb at least five inches (5") above finished floor.

(j) Drawings: The manufacturer shall submit the following drawings for approval by the Engineer prior to fabrication and assembly of control centers. (1) Schematic control diagrams showing connections to all outside devices included in the control scheme; (2) Complete wiring diagrams with individual device and master terminal designations and legend if necessary to indicate external machine or device to which connections are made; (3) Floor plan and dimensions.

When the job is complete, the Contractor shall provide the Owner with six (6) complete, clean sets of above drawings and any instruction sheets by the manufacturer which are necessary to the complete understanding of the operation or for future investigations for maintenance and repair.

10.12 Control Center Details, 240 Volt Service: The low voltage control center will be served by a 45 KVA bank of transformers. Incoming service will enter from below and services will exit from below. The control center shall consist of the following equipment:

(a) Equipment in Control Center:

One - 600 amp horizontal bus.

One - Ammeter, 100 amp scale, flush mounted with transfer switch.

One - Current transformer - 100/5 amps.

One - Voltmeter, 300 volt scale, flush mounted with transfer switch.

One - Main Breaker, 225 amps.

Two - Size two, starter for 15 H.P. for flushing water pump motors Nos. 3 and 4, 240 volt, 110 volt coils, H-O-A selector switch, interlocked on the automatic side with the respective screen starters.

One - Feeder breaker 20 amp, 3 pole, for 240 volt service to 5 H.P., 240 volt, 3 phase, hoist motor.

One - Size One starter for 240 volt, 3 phase, 7.5 KW electric heater, with H-O-A switch and RED run light.

Two - Size 0, starters for 1-1/2 H.P., 240 volt, 3 phase, traveling screen motors, with 110 volt coils, H-O-A selector switch, extra interlocks and terminals for remote starting with pneumatic controls, red run lights. Furnish a time delay relay to run the screen motors 4 minutes after an automatic start.

Eight - Sets, two pole Reliable protectors.

Six - Remote control relays, see Section No. 14.10, Paragraph (b).

(b) Associated Devices: The following devices are associated with the motor control center, but not contained therein:

One - Lighting panel board, flush mounted, 3 wire, single phase, 240/120 volt, Type NLQT for TQL plug in type breakers, as manufactured by General Electric Company or approved equal, with 100 amp TEF main breaker and 18 single pole branch circuits containing the following TQL breakers:

10	S.P.	20 amp
4	D.P.	20 amp

Two - Three pole, disconnect switches for 230 volt service to be located outside near the traveling screen motors, 1-1/2 HP, equal to G.E. Type THD, raintight, NEMA Type 3R.

Two - Safe Stop-Run-Jog stations in weatherproof enclosures mounted on wall near flushing water pump motors.

One - NEMA I flush mounted enclosure containing program clock for outside lighting control, Tork Model 7100, with H-O-A selector switch in door.

10.13 High Service Pumping Station: Furnish and install high service pumping equipment as shown on the plans and specified. Equipment shall fe as follows:

(a) High Voltage Starting Equipment: High voltage starting equipment shall be as specified under pumping equipment. The following equipment shall be located remote from the control center:

Three - Remote push button stations located in the plant monitoring panel, complete with RED run light. Furnished as part of the monitoring panel -

Three - Sets Limit switches and solenoid valves furnished as part of valve controls.

Three - Sets Lighting arrestors and Protective capacitors.

(b) Low Voltage Equipment:

One - 2300/208Y dry type transformers, 25 KVA, three-phase.

One - Lighting panelboard, flush mounted, 208Y, 4 wire, 3 phase, with 70 amp main breaker type NLAB branch breakers.

10.14 Control Building: The existing control building upper floor and monitoring panel shall be served from a new lighting panel board located in the control room. A new circuit shall be run to the existing entrance service to serve this lighting panelboard. The lighting panelboard shall be flush mounted 208Y, 4 wire, three phase, with 70 amp main breaker and type NLAB branch breakers.

10.15 Chemical Building: The chemical building will be served from the existing lighting panel. All new equipment will be served by a new surface mounted panelboard, 208Y, 4 wire, three phase with 70 amp main breaker.

10.16 Five Points Booster Station: The five points booster station is served with 240 volt three phase service. The new pump motor starter shall be a size 5 combination, closed transition auto transformer starter connected to the existing main breaker. The starter shall be furnished with a H O A switch and run light, the automatic side of the H O A switch shall connect to the existing telemetering system. The combination starter shall meet requirements for motor control centers. Wiring from the main breaker to the starter will enter the top wiring to the motor will exit the top. Provide terminals for incoming and exit wiring.

10.17 Bogart Booster Station: The Bogart booster station will be served by the REA cooperative. Two underground vertical turbine pumps will be installed. Electrical equipment and telemetering equipment will be mounted in steel weatherproof boxes consisting of the following equipment:

2 - Size 2 combination starters for 15 HP pump motors with H O A switch and red run light mounted in cover.

1 - Lighting Panel, single phase, 120 volt GE type NLAB with 50 amp main breaker and 6 NLTQ 30 amp branch breakers.

1 - Strip heater with thermostat to maintain temperatures between 50° and 60° F. during weather as cold as 5° F.

1 - Set of telemeter relays to transmit incoming motor start signals and outgoing running signals for both pumps, as well as flow and pressure signals.

The enclosures shall be similar and equal to Metal Stamping Company type WH, mounted on 4-inch pipe stands. The pipe stands shall be conduit for incoming and service lines for the box containing power equipment and for the box containing telemetering equipment. Approximate size of each box is 30-inches wide, 36-inches high, submit drawings of each box complete with electrical layouts. Boxes shall be of 10 gauge galvanized steel.

10.18 Lightning Arresters and Protective Capacitors: On motors of two raw water pumps, three high service pumps and the two Bogart booster pumps there shall be installed at the terminals of each motor a set of lightning arresters and a protective capacitor. These devices shall be hung beneath the pump motor floor in a suitable supporting framework of ventilated aluminum fabrication with removable expanded aluminum metal grills.

The arresters shall be of the station valve type, and the capacitors of 0.5 microfarads per pole, both of the types designed for the protection of

motors. In fabrication of the framework a clearance of at least 3-1/2 inches phase to phase and phase to ground must be observed. The exact location of the assembly will be determined by the location of the motor terminals, but should be such that not over 10 feet of conductor per phase is used for connection. The ground terminals shall be connected to the grounding system conductor specified under "Electrical."

10.19 Standardization: All starters, breakers, push buttons, safety switches, selector switches, panelboards and associated equipment or devices, whether in control centers or mounted separately, shall be of the same manufacture (unless otherwise specified), to facilitate maintenance and reduce stock of repair parts.

10.20 General Requirements, All Equipment and Devices: All equipment and devices, regardless where mounted, shall be provided with engraved nameplates for identification. All devices for mounting where conduit is concealed shall be for flush mounting. All interior devices, unless otherwise called for shall be NEMA Type 1. All exterior devices shall be NEMA Type 4 cast watertight, unless otherwise called for.

The Contractor shall furnish and install all necessary wiring, raceways, conduit and devices necessary for the safe and successful operation of equipment whether shown on the drawings or called for in these specifications or not.

10.21 Conduit Sizing: All conduit for low voltage wiring shall be sized in accordance with the following schedule.

At Contractor's option, where conduit size is doubtful due to number of conductors and/or length of run and number of bends, increase conduit by one size. No conduits shall be less than 3/4-inch.

	Number of Conductors								
Wire Size	1	2	3	4	5	6	7	8	9
#12	3/4"	3/4"	3/4"	3/4"	1"	1"	1"	1-1/4"	1-1/4"
#10	3/4"	3/4"	3/4"	1"	1"	1"	1-1/4"	1-1/4"	1-1/4"
#8	3/4"	3/4"	1"	1-1/4"	1-1/4"	1-1/2"	1-1/2"	1-1/2"	1-1/2"
#6	3/4"	1"	1-1/4"	1-1/2"	1-1/2"	2"	2"	2"	2"
#4	3/4"	1-1/4"	1-1/4"	1-1/2"	2"	2"	2"	2-1/2"	2-1/2"
#2	1"	1-1/4"	1-1/4"	2"	2"	2-1/2"	2-1/2"	2-1/2"	3"
#1	1"	1-1/2"	2"	2"	2-1/2"	2-1/2"	3"	3"	3"
#1/0	1"	2"	2"	2-1/2"	2-1/2"	3"	3"	3"	3-1/2"
#2/0	1"	2"	2"	2-1/2"	3"	3"	3"	3-1/2"	3-1/2"
#3/0	1"	2"	2"	2-1/2"	3"	3"	3-1/2"	3-1/2"	3-1/2"
#4/0	1-1/4"	2"	2-1/2"	3"	3"	3-1/2"	3-1/2"	4"	4"
250 MCM	1-1/4"	2-1/2"	3"	3"	3-1/2"	3-1/2"	4"	4-1/2"	4-1/2"
300 MCM	1-1/4"	3"	3"	3-1/2"	3-1/2"	4"	4-1/2"	4-1/2"	5"
350 MCM	1-1/2"	3"	3"	3-1/2"	4"	4"	4-1/2"	5"	5"
400 MCM	1-1/2"	3"	3-1/2"	3-1/2"	4"	4-1/2"	4-1/2"	5"	6"
500 MCM	1-1/2"	3"	3-1/2"	4"	4-1/2"	4-1/2"	5"	6"	6"

10.22 Payment: No separate payment will be made for work under this section of specifications. The costs of all such work, and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.

SECTION NO. 11

PAINTING

DIVISION TWO

11.01 Scope: The work covered by this section of Specifications consists of furnishing all material, and equipment, and performing all labor necessary for painting all surfaces constructed, and all equipment, piping, conduit, etc., installed which are specified to require painting in this section of Specifications, including touch paintings which will be required after completion of work in the existing structures.

11.02 Material: Materials for use in this work shall be delivered in unbroken original containers, bearing the manufacturer's name, and shall be mixed and applied in conformance with the manufacturer's specifications and directions.

11.03 General: Painting shall be done in a first-class, workmanlike manner, and no paint shall be applied upon damp or frosty surfaces, or in wet, foggy or freezing weather. All surfaces shall be brushed free of dust, and all foreign matter removed before any paint is applied. All surfaces shall be completely dry before any paint is applied. All iron and steel and other metal work which is shop primed shall have all abrasions in the priming coat cleaned by wire brushing, sandpaper or an approved method to bright metal, so as to remove all scale, ridges, rust or faults in the prime coat. All welding splatter shall be removed and this area re-primed. All voids, open or hollow places shall be repaired with a material suitable to the surface to be repaired. Paint shall be evenly spread and well brushed out, so that there shall be no drops, runs or sagging of the coating. Where runs and drops do occur, they shall be removed and the surface re-coated to the satisfaction of the Engineer. Sufficient time as directed by the manufacturer, shall be allowed for the paint to dry before the application of succeeding coats. Drop cloths shall be used to protect other surfaces of the structure or equipment in place, and upon completion of work all paint spots shall be removed from surfaces as directed by the Engineer, and any defaced surfaces shall be refinished as directed by the Engineer. Any painting work found to be defective or applied under adverse conditions shall be removed and replaced at the direction of the Engineer. No paint shall be applied unless temperature is above 50 degrees F. or area may be kept above 50 degrees F. during paint application and until paint has set or cured for 24 hours.

11.04 Surfaces Requiring Painting: Surfaces requiring painting under this contract shall include all exposed surfaces constructed under this contract, except concrete floors, concrete stairs and tile surfaces. Painting under this contract shall also include all exposed interior piping, equipment, conduit and other such work installed under this contract. Grating will not be painted.

Exterior surfaces requiring painting shall include windows, doors and exposed miscellaneous iron and steel. Surfaces requiring painting in basins shall consist of equipment, piping and exposed miscellaneous iron and steel. Grating will not be painted.

11.05 Preparation for Painting Structural Surfaces: Structural surfaces to be painted, including concrete surfaces, brickwork, plaster and pre-cast concrete slab ceilings, shall be thoroughly dry and clean. Concrete work shall be rubbed and finished in accordance with provisions of Section No. 4. Brickwork shall be carefully painted and cleaned of all adhering mortar and other foreign matter.

The above surfaces shall be further cleaned as follows:

(a) Concrete and Masonry Surfaces: Using stiff scrubbing brushes, scrub and neutralize with dilute muriatic acid solution thoroughly and wash down completely with fresh, clear water. Flushing shall be performed before the acid solution dries and forms acid salts. All traces of dust, form oil, curing compound or other foreign matter shall be carefully removed. Allow two to four days for complete, thorough drying, or longer if necessary, depending upon humidity and temperature. Space heaters shall be used if due to condensation or temperature conditions, painting may not otherwise be accomplished. No painting shall be started unless surfaces are thoroughly dry and they shall be kept dry during all painting operations.

11.06 Painting Structural Surfaces: Painting structural surfaces outlined above shall be accomplished by applying two coats of INERTOL Ramuc Utility Mildew resistant undercoats at the rate of 200 square feet per gallon and allowing 24 hours drying time for each coat. Finish shall consist of one coat of INERTOL Ramuc Utility Mildew Resistant Enamel applied at the rate of 250 ampere feet per gallon with drying time of 24 hours.

11.07 Painting Miscellaneous Iron and Steel Work: 'Miscellaneous iron and steel work and structural steel work before leaving the shop of the fabricator and before being exposed to weather, shall be thoroughly cleaned of all foreign matter, loose black scale and rust, and shall receive a priming coat of INERTOL Rust-Inhibitive Primer No. 621, applied in the shop at the rate of 250 square feet per gallon, and allowing 48 hours to dry. Whenever the priming coat has been damaged in transit, or during construction, or has become deteriorated due to long exposure to the elements, the metal shall be cleaned, touched up, or re-primed to the satisfaction of the Engineer.

(a) General Interior Work: After erection, all miscellaneous iron and steel work, including floor plates, installed inside of buildings shall be painted with two coats of INERTOL Glamortex Enamel. These coats are to be applied at the rate of 400 square feet per gallon, allowing 24 hours drying time between each coat.

(b) General Exterior Work: After erection, all miscellaneous iron and steel work to be installed outside of buildings, including floor plates installed outside of buildings, shall be painted with two (2) coats of INERTOL Glamortex Enamel, applied at the rate of 400 square feet per gallon, allowing 24 hours drying time between each coat, in colors to be selected by the Engineer, or with two (2) coats of INERTOL Bakelite Resin Aluminum No. 5510, applied at the rate of 400 square feet per gallon, allowing 24 hours drying time before each coat, as may be directed by the Engineer.

(c) Pits and Vaults: After erection, all miscellaneous iron and steel work to be installed in pits, vaults, and other locations where the steel work is to be exposed to extreme humidity and condensation, shall be painted with three (3) coats of INERTOL Ramuc Utility Enamel. Coverage shall be 250 square feet per gallon, allowing 24 hours drying time between each coat.

(d) Structural Steel Work: After erection, all structural steel work shall be painted with two (2) coats of INERTOL Ramuc Utility Enamel, applied at the rate of 250 square feet per gallon and allowing 24 hours drying time between coats.

(e) Underwater Work: All miscellaneous iron and steel work to be installed in locations which will be normally covered with water shall be sandblasted to gray-white metal, primed with one coat of INERTOL 621 at the rate of 250 sq. ft. per gallon, allow 48 hours drying time and then apply three (3) coats of INERTOL No. 49 THICK (black) applied at the rate of 180 square feet per gallon and allowing 48 hours drying time between each coat. All portions of iron and steel, which after erection, are inaccessible for sandblasting and painting shall be cleaned and coated prior to installation. All iron and steel sandblasted shall have a prime coat of INERTOL No. 621 the same day. Any area not primed the same day shall be resandblasted prior to applying prime coat. Paint primed piping where installed underground.

11.08 Painting Galvanized Iron Work: All galvanized iron work shall be thoroughly cleaned in the shop if possible, and treated with INERTOL Metal Passivator No. 35; within 24 hours after such treatment a priming coat of INERTOL Rust-Inhibitive Primer No. 621 shall be applied at the rate of 250 square feet per gallon, and 48 hours allowed for drying time. After erection, galvanized iron work shall be re-primed with INERTOL No. 626 primer as necessary and painted with two (2) coats of INERTOL Ramuc Utility Enamel, applied at the rate of 250 square feet per gallon and allowing 24 hours drying time between each coat. Galvanized steel grating and steel I beam supports will not be painted.

11.09 Painting Cast Iron Piping: After installation, all exposed cast iron piping systems, including fittings and valves, shall be thoroughly cleaned of all loose paint, dirt, oil, grease, rust, scale and other foreign materials, after which one (1) coat of INERTOL No. 621 Primer shall be applied. The finish shall consist of two (2) coats of INERTOL Ramuc Utility Enamel, applied at the rate of 250 square feet per gallon and allowing 24 hours drying time for each coat. Cast iron pipe is specified to be furnished unprimed. Apply two (2) finish coats.

11.10 Painting Small Piping: Small exposed control and plumbing piping shall be given a suitable priming coat with due regard to the surface which it is to cover. Prime coat for wrought iron shall be as specified for miscellaneous iron and steel. Prime coat for galvanized iron pipe shall be as specified for galvanized iron work. Finish painting shall consist of two (2) coats of INERTOL Ramuc Utility Enamel, applied at the rate of 250 square feet per gallon, allowing 24 hours drying time between coats.

11.11 Painting and Color Coding Copper Piping Systems: After installation all copper piping systems shall be cleaned, polished and coated with two (2) coats of clear INERTOL Rigortex 3305 Vinyl finish coat. After cleaning and prior to coating with clear vinyl as specified above, all small copper piping systems shall be color coded by means of banding at intervals with an approved material. Piping color code for water, supply air, control air, vacuum, oil, and color code for all other such piping uses shall be as directed by the Engineer. Small piping systems other than copper shall be color coded after painting. Piping shall be color coded at each equipment connection, at each line union, and in each separate area where entering and leaving such area.

11.12 Painting Electrical Conduit: All exposed electrical work, including conduit, condulets and cabinets, shall be thoroughly cleaned and given a suitable prime coat, with due regard to the surface it is to cover. Finish painting shall consist of two (2) coats of INERTOL Ramuc Utility Enamel, applied at the rate of 250 square feet per gallon, and allowing 24 hours drying time for each coat. Color of finish coat shall, in general, be the same as the color of

the surfaces upon which the conduit is mounted or hung, unless otherwise directed by the Engineer.

11.13 Painting Doors and Windows: Interior and exterior ferrous metal doors and windows shall receive a priming coat of INERTOL Rust-Inhibitive Primer No. 621 applied in the shop. After installation of ferrous metal doors, frames and windows, with associated hardware, all surfaces shall be cleaned, and surfaces within the building interior shall be painted with two (2) coats of INERTOL Ramuc Utility Enamel, applied at the rate of 250 square feet per gallon, allowing 24 hours drying time for each coat. Surfaces on the building exterior shall be painted with two (2) coats of INERTOL Glamortex Enamel, applied at the rate of 400 square feet per gallon, allowing 24 hours drying time for each coat. Doors and windows of non-ferrous metal shall not be painted, unless otherwise specified.

11.14 Painting Equipment and Machinery: Machinery and equipment shall be thoroughly cleaned and painted with three (3) coats of INERTOL Ramuc Utility Enamel, applied at the rate of 250 square feet per gallon, allowing 24 hours drying time for each coat. Special care shall be used to leave all name plates and non-ferrous metal trim unpainted unless otherwise directed by the Engineer.

11.15 Colors and Dado: Where more than one coat of paint is required, paint for each undercoat shall be job tinted off shade, sufficient to show complete coverage for each coat. The colors of paints for the various parts of the work shall be as selected by the Engineer. The lower four (4) feet of walls and partitions shall have dado stripe and color darker than the upper walls and ceilings, unless otherwise specified or directed by the Engineer.

11.16 Service and Inspection: The Contractor shall require the paint manufacturer to furnish the services of a qualified and trained representative of said manufacturer to set up the initial painting operations, to make regular inspections when painting is in progress, and to be available on call, to render such service connected with painting operations as is necessary to the Contractor and/or Engineer.

11.17 Waterproofing: Apply waterproofing to outside surfaces of all walls of dry pit areas in contact with earth. Waterproofing of walls shall extend from and include the tops of footings to lines laid off accurately, 6-inches below grade. Surfaces to be water proofed include the following:

(a) Raw Water Intake, above elevation 42.0

(b) High Service Pumping Station.

(c) Additions to Chemical Feed Building.

11.18 Surface Repairs and Preparation: All uneven work, sharp corners and projections shall be smoothed down. All surfaces showing aggregate or visible holes shall be cut out and pointed with a special bonding coat equivalent to Isovol by Truscon Laboratories or similar Master Builders product.

After repairs and inspection by the Engineer, all concrete surfaces to be waterproofed shall be cleaned with a 10% solution of Muriatic Acid and thoroughly washed and allowed to dry before applying waterproofing.

11.19 Waterproofing Materials: Apply two (2) coats of Inertol No. 7 at a rate of one (1) gallon per 100 square feet for each coat of approximately 8 mils thickness. Total thickness of both coats shall be not less than 16 mils. Waterproofing shall be applied by brush, in strict compliance with manufacturer's instructions. Coating shall be tested with a low voltage Holiday detector.

11.20 Payment: No separate payment will be made for work under this specification, except as may be specifically set forth in the Proposal. The cost of such work and all cost incidental thereto, except such work as may be specifically set forth in the Proposal, shall be included in the price bid for the item to which the work pertains.

SECTION NO. 12

PIPE LINES AND APPURTENANCES

12.01 Scope: The Contractor shall furnish all material, except as specified herein, all labor, tools, construction equipment, of whatever nature, necessary to construct and put in complete working order the pipe lines and appurtenances shown on the drawings and specified. The work shall include all clearing, trenching and excavation, pumping, bailing and draining, sheeting, pipe laying, backfilling, flushing, testing and sterilization of lines and all provisions necessary to protect and maintain buildings, fences, water and gas lines, power and telephone lines and cables, drainage and other structures, the furnishing and maintenance of suitable bridges and footways across intercepted streets, alleys and walkways, the replacing of street pavement, the cleaning away of all rubbish and surplus excavated material, and all such other work as may be necessary to complete the project.

12.02 Iron Pipe and Fittings:

(a) Ductile Iron Pipe (For sizes 16-inch and larger): Pipe shall be centrifugally cast and shall conform to ASA Specification A21-51, Grade 60-42-10, with push-on joints and laying lengths of at least 16 feet. Pipe shall have Class I wall thicknesses unless otherwise shown on the plans and set forth in the Proposal and shall be for 200 psi working pressure.
(b) Gray Iron Pipe (For sizes 16-inch and smaller): Pipe shall be centrifugally cast and shall conform to ASA Specification A21-6 or A21-8, with push-on joints and laying lengths of at least 16 feet. Pipe shall be 18/40 iron with Class 23 wall thicknesses unless otherwise shown on the plans and set forth in the Proposal.

(c) Fittings: Fittings shall be cast from gray or ductile iron and shall conform to ASA Specifications A21-10, 1964. Fittings shall have standard mechanical joints and shall be Class 250.

(d) Outlets: Outlets for connections to 6-inch blow-offs shall be made with a boss cast or welded on the pipe, the boss to be faced, drilled and tapped for ASA Specification B16-1, Class 125, flanged connection.

Outlets size 2-inch and smaller shall be provided with threads to fit Mueller I.P. thread corporation stops.

(e) Lining and Coating: Pipe and fittings shall be cement-lined inside and bituminous coated outside, in accordance with the applicable provisions of Federal Specification WW-P-421b. The inside cement lining shall be treated with a bituminous seal coat.

(f) Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ASA Specification. The class designations for the various classes of pipe and fittings shall be cast onto fittings in raised numerals, and cast or stamped on the outside of each joint of pipe. Weights shall be plaining and conspicuously painted in white on the outside of each joint of pipe and each fitting after the exterior coating has hardened.

(g) Certification: The manufacturer of iron pipe and fittings shall furnigh both the Engineer and the Owner with certified reports stating that inspection and specified tests have been made and that the results thereof comply with the applicable A.S.A. Specifications for each.

12.03 Steel Pipe and Fittings:

(a) Steel Pipe (For sizes 16-inch and larger): Pipe shall conform to A.W.W.A. Specification C-202-60T for electrically welded or seamless steel pipe with formed bell-and-spigot rubber gasket joints and laying lengths of at least 20 feet. Pipe shall be fabricated from steel plates conforming to A.S.T.M. Specifications for low and intermediate tensile strength carbon steel plate of structural quality, A.S.T.M. Designation A-283 (Grade B). After jointing the pipe the void in the bell from the gasket retainer bar to the bell mouth shall be filled with Koppers 70B enamel or approved equal by the use of a "snake" or other approved method. Pipe shall be Class 150, minimum 0.188 inch wall.

(b) Fittings: Fittings shall be fabricated the same thickness and I.D. as the pipe and shall conform to A.W.W.A. Specification C-202-60T. Maximum angular change shall not exceed 22-1/2 degrees per cut. Fitting wall thicknesses shall be the same as the associated pipe reinforced as necessary.

(c) Outlets: Outlets for connections to 6-inch blow-offs, shall be flush flanged outlets faced, drilled and tapped for A.S.A. Specifications B-16-1, Class 125, flanged connection.

Outlets size 6 inch and larger, other than those for 6-inch blow-offs, shall have mechanical joint bells.

Outlets size 2 inch and smaller, shall be provided with threads to fit Mueller I.P. thread corporation stops and reinforced as necessary.

(d) Lining and Coating: Pipe and fittings shall be cement lined inside in accordance with A.W.W.A. Specification C-205-62T. Exterior surfaces of all steel pipe and fittings shall be cleaned, primed and coated with coal tar enamel, "Jet-Set" primer and Bitumastic 70B enamel or approved equal, and wrapped with bonded asbestos felt in accordance with A.W.W.A. Specification C-203-57. After completion of factory coating and wrapping operations, the pipe and fittings shall be wrapped with Kraft paper. The manufacturer of the steel pipe and fittings will be required to conduct an electrical inspection of exterior coatings in accordance with Section 3-313 of A.W.W.A. Specifications for coal tar protective coatings prior to shipment.

(e) Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of A.W.W.A. Specifications. Each length of pipe and fitting shall be legibly marked by paint stenciling or die stamping to show manufacturer's name or mark, size of pipe, weight, and class designation.

(f) Certification: The manufacturer of steel pipe and fittings shall furnish both the Engineer and the Owner with certified reports stating that inspection and specified tests have been made and that the results thereof comply with the applicable A.W.W.A. Specifications.

12.04 Accessories: Glands, bolts and gaskets, dresser couplings, lubricants, and all other items required to install the pipe line shall be furnished by the pipe supplier. Glands, bolts and gaskets are furnished with the valves.

12.05 Standard Gate Valves: The Contractor shall furnish and install all gate valves as indicated on the drawings, listed in the Proposal, and specified herein. Gate valves size 2-inch and larger shall conform, in general, with the latest specifications of the American Water Works Association, Designation C500-61, shall be equipped with "O" ring packing and shall be as follows:

(a) General Construction: Gate valves shall embody the best class of workmanship and finish, and shall open and close freely and easily. In closing the gates shall move to their position opposite the ports, both discs being then closed squarely against the seat rings. With discs raised, each valve shall have a clear water way of the full nominal diameter of the valve. All wearing and bearing faces shall be suitable proportioned, and all working parts shall be of bronze, or bronze mounted. The seats and face rings for the valve discs shall be of satisfactory dimensions, according to the best shop practice, and the seat rings shall be faced in a lathe, to a true and even surface, so to form a watertight joint when drawn together; and if such joint cannot be produced by machine work, then the faces shall be dressed, and with disc ground to its own true bearing without the aid of templates. Such face rings shall be securely screwed into the recesses made therefor in the valve case. The face rings of the discs shall be machined, dovetailed or driven into corresponding machined grooves in the discs of gates and riveted on with suitable non-corrodible metal rivets. Gate valves shall be furnished for vertical installation, N.R.S. with operating nuts.

(b) Working Pressure: Gate valves 12 inches and smaller shall be furnished for 175 p.s.i. water working pressure.

(c) Operation: All valves shall open left. Valves shall be operated by nut. Operating nuts shall conform to present city standards and shall have an arrow cast on them, indicating the direction for opening the valve.

(d) Marking: Each valve shall be plainly marked with the manufacturer's name or particular mark, the year of manufacture, the size of the valve and designation indicating working pressure, all cast on the bonnet or body,

(e) Installation: Gate valves 12-inches and smaller shall be furnished for vertical installation, N.R.S. with operating nut.

(f) Testing: All gate valves shall be tested in accordance with American Water Works Association Standards.

(g) Jointing: All gate valves, unless otherwise indicated on the drawings or necessary to join to existing work, shall be furnished with mechanical joints, and necessary bolts, glands and gaskets.

(h) Valve Boxes: All gate valves shall be equipped with valve boxes. Valve boxes shall be heavy roadway type. The valve boxes shall be cast iron two piece slide type with drop covers. The word "WATER" shall be

cast in raised letters on the cover. The valve boxes shall be adjustable to 6" up or down from the nominal cover over the pipe.

(i) Manufacture: Valves shall be furnished as manufactured by Mueller Company, or A. P. Smith Manufacturing Company.

(j) Testing: All valves shall be field tested by internal pressure, leaking valves will be rejected.

12.06 Butterfly Valves: All butterfly valves furnished under this section of Specifications shall be of the tight closing rubber seat type, with rubber seats which are recess mounted into the valve body and shall be furnished as manufactured by the Henry Pratt Company, Darling-Pelton or Builders-Providence, Inc. Wafer type butterfly valves will not be acceptable. All such valves shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity. Valves shall be suitable for installation with the valve shaft in any position and the clear inside diameter of each such valve shall not be less than the nominal valve size minus one inch. All valves furnished under this section of Specifications shall comply with the requirements of A.W.W.A. Specification C-504-58 except as otherwise specified herein, and shall be furnished as shown on the drawings and/or as specified. In general all valves 16-inch or larger shall be butterfly valves except as shown or specified otherwise.

(a) Class: Butterfly valves for high pressure service shall be Class 125-16 suitable except for sizing operator for 150 psi shut-off.

(b) Valve Construction: Construction of butterfly valves, including valve bodies and flanges, valve discs, shafts, seats and bearings, shall be in accordance with the following requirements.

(1) Valve Bodies and Flanges: Valve bodies shall be constructed of close grain cast iron A.S.T.M. A-126 Class B and shall have ends for Dresser Coupling to steel pipe, mechanical joint or hub end for bell-spigot leaded joints for cast iron connections or joints for prestressed concrete. Two trunnions for shaft bearings shall be integral with each valve body.

(2) Valve Discs: Valve discs shall be cast of stainless cast iron containing at least 14% nickel, 6% copper, and 2-1/2% chromium (Military Specifications MIL-G-858a, Class One).

(3) Valve Shafts: Shafts of all valves shall be turned, ground and polished 18-8 Type 304 stainless steel. Each shaft shall extend full size through the valve discs and bearings and shall be securely attached to the valve disc by means of "tangentially" fitted stainless steel taper pins or keys.

(4) Valve Seats: Valve seats shall be of Hycar or natural rubber.

(5) Valve Bearings: Butterfly valves shall be fitted with sleeve type bearings contained in the bearing trunnions of the valve body. Bearings shall be self-lubricated and shall be constructed of bronze impregnated with a silicone oil or of nylon. In addition to the shaft bearings, each valve 24" and larger shall be equipped with an adjustable thrust bearing which is totally enclosed and protected

and which is set and locked to hold the valve disc and shaft assembly securely in the center of the valve seat. Valves designed for shaft connection to an operator shall be provided with a shaft bearing beyond the stuffing box gland. The housing for this bearing shall be rigidly to the valve body or may be fitted into the valve operator assembly which in turn shall be rigidly attached to the valve body.

(6) Valve Operators, Manual Type: All butterfly valves furnished under this section of Specifications shall be furnished with manual type valve operators, except as shown on the plans. Valve operators shall be designed to hold the valve disc in any intermediate position between fully open and fully closed without creeping or fluttering, and shall be capable of transmitting sufficient torque to open and close each valve under operating conditions shown on the drawings. All manual operators shall be Pratt Sidewinder or equal for the service indicated.

(c) Manufacture: Valve shall be as manufactured by Pratt, BIF, or equal.

12.07 Tapping Sleeves and Valves: Tapping sleeves shall be of the split sleeve mechanical joint or "Hackensack" type, as required. Gate valves furnished with tapping sleeves shall be furnished in accordance with the above description of the gate valves, where applicable. Hub connections of the gate valves shall be mechanical joint. Tapping sleeves and valves shall be furnished as manufactured by A. P. Smith Manufacturing Company, Mueller or equal.

12.08 Concrete and Cement Mortar: Concrete of the respective classes for structures, manhole bottoms, bedding, encasement, and blocking shall conform to the provisions of Section No. 4 herein. Cement mortar for brickwork shall be made of one part Portland cement and two parts clean, sharp masonry sand.

12.09 Reinforcing Steel: Materials, fabrication and installation of reinforcing steel shall conform to the provisions of Section No. 5 herein, and to the details shown on the plans.

12.10 Miscellaneous Iron Castings: Materials, fabrication and installation of miscellaneous iron castings shall conform to the provisions of Section No. 5 herein and to the details shown on the plans.

12.11 Manhole Brick: Brick for manhole construction shall be whole, hard, burned common brick conforming in all respects to A.S.T.M. Specifications, Grade MA.

12.12 Corporation Stops: Corporation stops, where called for on the plans, or otherwise directed by the Engineer, shall be Mueller or approved equal in the sizes required.

12.13 Handling Materials:

(a) Unloading: Equipment and facilities for unloading materials shall be furnished by the Contractor and shall at all times be available for use in promptly unloading materials. Delays in unloading railroad cars, unloading trucks or hauling from freight terminals which incur demurrage, truck waiting charges or terminal charges shall be at the expense of the Contractor.

(b) Handling: Pipe, fittings, valves and other materials shall be carefully handled to prevent breakage or damage. Pipe shall not be rolled or dropped off of cars or trucks but shall be handled by carefully lifting and lowering into position, using approved slings or pipe clamps which shall be provided for the purpose. Special care shall be used to prevent damage to exterior coatings and interior cement linings of pipe and fittings.

(c) Distributing: Materials shall be so distributed and placed as to least interfere with the movement of traffic. Distributed materials shall not be placed inside drainage ditches.

(d) Storage: All pipe, fittings and other materials which cannot be distributed along the line of the work shall be stored for subsequent use when needed. The Contractor shall make his own arrangements for the use of storage areas.

(e) Responsibility for Replacement: The Contractor shall be responsible for the replacement, at his expense, for all materials broken or damaged through faulty handling. This responsibility shall extend to all materials furnished by the Owner at warehouses or storage yard sites.

(f) Payment: No separate payment will be made for the above work. The cost of such work, and all costs incidental thereto shall be included in the unit prices bid for the item to which the work pertains.

12.14 Location and Grade: Location and grade for the pipe line and the position of all fittings, outlets and appurtenances will be established by the Engineer, as may be required.

The Contractor shall provide such labor and assistance as the Engineer may request, and such hubs, stakes, spikes, nails and other fastenings as may be required in the prosecution of such layout work.

12.15 Organization of Work: The Contractor shall so organize his work that backfilling and cleanup shall closely follow pipe laying operations.

In general, not more than one block of a street or 500 feet of a road shall be closed for construction at any one time. Before proceeding with trenching operations in a succeeding block, the preceding section shall be backfilled, cleanup completed and the street opened to traffic.

For work outside of streets and roads, backfilling and windrowing, in accordance with the provisions of Paragraph 12.35 following shall be performed in such manner that not more than 500 feet of trench shall remain open at any one time.

Failure on the part of the Contractor to comply with the above provisions in a reasonable manner, in the opinion of the Engineer, shall be sufficient cause for the Engineer to order a temporary shutdown of further trenching and pipe laying operations until the provisions are complied with.

12.16 Clearing: The Contractor shall perform all clearing necessary for installation of the complete work. Clearing shall consist of removing all trees, stumps, roots, brush and debris in the way of the work. All combustible

material shall be completely burned or otherwise disposed of in a satisfactory manner.

12.17 Removing and Resetting Fences: At all locations where existing fences must be removed to permit construction of pipe lines and appurtenances, the Contractor shall remove such fences and, as the work progresses, reset the fences in their original location and at least to their original condition. During construction, the Contractor shall provide such temporary fencing, or employ other safeguards, as will prevent stock and cattle from straying.

12.18 Protecting Trees, Shrubbery and Lawns: Trees and shrubbery along trench lines shall not be disturbed unless absolutely necessary, subject to the approval of the Engineer. Any such trees and shrubbery necessary to be removed shall be properly heeled in and replanted. Heeling in and replanting shall be done under the direction of an experienced nurseryman.

Where trenches cross through established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replacement is approved by the Engineer. Topsoil underlying lawn areas shall likewise be removed and kept separate from general excavated materials. Removal and replacement of sod shall be done under the direction of an experienced nurseryman.

12.19 Protecting Existing Utilities and Structures: Any damage done to existing underground utility lines and service lines, to telephone and power lines and poles, and to structures of every nature, including walls, steps, signs, drains, and cross-drains, etc., shall be promptly repaired or replaced by the Contractor at his expense. The approximate location of certain known underground lines and structures are shown on the plans for information only. Existing small lines are not shown. The Contractor shall locate these and other possible unknown utility lines by use of an electronic pipe and cable finder which he shall furnish and have available, in working order, at all times. All underground lines shall be located and exposed in advance of trenching operations.

Removing and relaying of utility lines and services which constitute an obstruction to the completed line and grade of the new work, in the opinion of the Engineer, will be made at the expense of the Owner, unless otherwise shown on the plans to be altered by the Contractor.

12.20 Bridging Open Trenches: Where trenches cross streets, walks, driveways and such other points as may be directed by the Engineer, the trenches shall be bridged as necessary, in an open and secure manner, so as to prevent any serious interruption of travel upon the roadway or sidewalks, and also to afford necessary access to public or private premises. The material used, and the mode of constructing said bridges, and the approaches thereto, must be satisfactory to the Engineer.

12.21 Construction Along Highways, Streets and Roadways: The Contractor shall install pipe lines on and along highways, streets and roadways in accordance with the applicable regulations of the State, County and City Highway and Street Departments with reference to construction operations, safety, traffic control, maintenance and repair, and in accordance with the following:

(a) Protection of Traffic: No highway, street or roadway shall be closed without first obtaining permission from the proper authorities. The

Contractor shall provide suitable signs, barricades, lights and flagmen, as required, where traffic may be endangered by construction operations. All highway and street signs temporarily removed by reason of construction shall be promptly replaced as construction progresses.

(b) Construction Operations: The Contractor shall construct all work using the following sequence of operations, so as to least interfere with traffic:

(1) Stripping: Where pipe lines are laid along road shoulders or within the right-of-way, all sod, topsoil and other material suitable for shoulder or right-of-way restoration shall be stripped and stockpiled for later replacement.

(2) Trenching, Laying and Backfilling: Trenches shall not be opened any further ahead of pipe laying than is necessary for proper laying operations. Trenches shall be progressively backfilled and consolidated, and excess material removed immediately behind pipe laying operations.

(3) Shaping: Immediately after completing backfill operations, the Contractor shall re-shape damaged cut and filled slopes, side ditches and ditch lines and shall replace topsoil, sod and other materials to the original condition and to the full satisfaction of the Engineer and other agencies having jurisdiction thereover.

(4) Personnel and Equipment: The Contractor will be required to provide adequate personnel and equipment so as to simultaneously carry out all of the above operations.

(c) Excavated Material: Excavated material shall not be placed in such manner as to interfere with traffic. No excavated material shall be allowed to remain on the pavement; all scattered material shall be broomed and swept away.

(d) Drainage Structures: All side ditches, culverts, cross drains and other drainage structures shall be kept clear of excavated material and be free to drain at all times.

(e) Maintenance: A road grader, or other suitable equipment, shall be furnished and be available at all times for maintenance work along the line of construction operations. Highways, streets and roadways shall be maintained in suitable condition for the movement of traffic until completion and final acceptance of the work. Private driveways that are cut or damaged shall be immediately repaired and maintained in similar fashion.

(f) Payment: No separate payment will be made for the above work. The cost of such work, and all costs incidental thereto shall be included in the unit prices bid for the item to which the work pertains.

12.22 Removing Pavement: The Contractor shall remove pavement as necessary for installing the new pipe lines and appurtenances and for making connections to existing pipe lines. Asphaltic concrete and concrete pavement shall be cut back from the top edges of ditch lines for a distance of at least nine (9) inches on each side of the ditch to allow for solid bearing edges for pavement

to be replaced.

(a) Marking: Before removing any pavement, the pavement shall be marked for cuts neatly paralleling pipe lines and existing street lines. Asphalt pavement shall be broken along the marked cuts by use of jack hammer or other suitable tool. Concrete pavement and asphalt pavement on concrete base shall be scored to a depth of approximately 1-1/2 inches below the surface of the concrete along the marked cuts. Scoring shall be done by use of rotary saw, after which the pavement may be broken below the scoring by use of jack hammers or other suitable tool.

(b) Machine Pulling: No pavement shall be machine pulled until completely broken and separated along the marked cuts.

(c) Damage to Adjacent Pavement: The pavement adjacent to pipe line trenches must not be disturbed or damaged. If the adjacent pavement is disturbed or damaged, due to any cause such as caving ditch banks, indiscriminate use of construction machinery, etc., the Contractor shall remove the damaged pavement and shall replace it at his own expense.

(d) Payment: The removal and replacement of pavement will be paid for as a separate item, on the basis of measured quantity of pavement removed and replaced at the unit prices bid in the Proposal.

12.23 Trench Excavation: Excavation for trenches shall include the removal of all material of every description and of whatever substance encountered, to the depths and widths shown on the plans and specified herein, together with all pumping, bailing, draining, sheeting, bedding and such other work as may be required to permit pipe laying to proceed.

(a) Trench Width: Trenches shall be excavated to sufficient widths to allow proper installation of pipe, fittings and other appurtenances. In general, trench widths shall be such as to not exceed 6 inches clear of the outside diameter of the pipe bell on any site and at any point along the trench.

(b) Trench Depth: Trenches shall be excavated to such depths as to provide a minimum cover of 3 feet over the pipe barrel, except as otherwise shown on the plans or directed by the Engineer. Where pipe lines are located along or within the right-of-way limits of highways, streets, or roadways, the stated minimum depth of cover shall be considered as being below the nearest edge of pavement.

(c) Extra Trench Depth: Where shown on the plans, or directed by the Engineer, trenches shall be excavated to depths in excess of those required to provide up to 3 feet of cover, when required to avoid interference with underground utilities and obstructions or to attain necessary grade.

(1) Payment: Payment for extra depths of cover will be made in accordance with the unit prices bid in the Proposal for the various sizes of pipe at the extra depths of cover stated.

(d) Bell Holes: Bell holes of ample depth and width shall be excavated in pipe trenches at the location of each joint to permit the joint to be

properly made and to insure uniform bearing of the pipe barrel on the bottom of the trench.

(e) Bedding: In locations where pipe is to be bedded in earth excavated trenches, the bottom of such trenches shall be fine graded to allow firm and uniform bearing for the bottom of the pipe barrel on undisturbed earth. Where any part of the trench has been excavated below the grade of the trench, the part excavated below such grade shall be filled with compacted bank sand.

12.24 Trench Excavation in Rock: Rock excavation shall comprise solid rock in the original bed or in well defined ledges, the removal of which, in the opinion of the Engineer, requires drilling and blasting or the use of jackhammers or bullpoints. Concrete and masonry structures that require drilling and blasting for removal shall be considered as solid rock unless otherwise provided for herein. Boulders or detached pieces or rock having volumes of more than 8 cubic feet shall also be considered as solid rock.

Where rock is encountered at grade, the trench shall be excavated not less than 8 inches below the barrel of the pipe and refilled with thoroughly compacted crushed stone.

All rock excavated from trenches shall be hauled away and disposed of in locations arranged for by the Contractor, except that rock completely shattered into small fragments by blasting may be mixed with earth backfill when approved by the Engineer for specified locations.

(a) Payment: Rock excavation will be paid for at a unit price of Twelve and 00/100 ($12.00) Dollars per cubic yard as stated in the Proposal, such price to be in addition to that paid per foot of pipe line and to include the furnishing and placing of crushed stone to a depth of 6 inches below the barrel of the pipe, together with the haulding away and disposal of excavated rock. Rock excavation will be measured for payment for a width of trench equal to 4/3D plus 12 inches, where D is the nominal diameter of the pipe, the sides of trench being considered vertical, and to a depth of 6 inches below the barrel of the pipe. The minimum trench width for payment shall be 2 feet.

12.25 Blasting: Blasting operations shall be conducted in strict accordance with existing ordinances and regulations and shall be done only after the Engineers approval of the method and quantity of the explosive to be used. All exposed structures shall be carefully protected from the effects of blast and all blasts shall be covered with heavy timbers, mats or other suitable material. Blasting shall be done only by experienced workmen. Any damage done shall be promptly repaired by the Contractor at his own expense. All blasting supplies shall be stored in a manner conforming with local laws regulating the storage of such materials. In no case shall blasting caps be stored at the place where dynamite or other explosives are stored.

12.26 Dewatering Trenches: All excavation shall be dewatered properly before laying pipe. Where running sand is encountered, dewatering shall be done by well pointing whenever possible. Where soil conditions are not favorable for use of well point, french drains of graded stone shall be constructed to suitably located sumps and the water removed by bailing or pumping. All costs of equipment, labor and materials required for dewatering shall be included in the prices bid for pipelines.

12.27 Crushed Stone Stabilization: Wherever the subgrade is by nature too soft or mucky, in the opinion of the Engineer, for the proper installation of the pipe, he may order the Contractor to under cut the trench and backfill with crushed stone or gravel, 3/4-inch in size and less. The stone so placed shall be brought to the grade required for the particular location and compacted.

(a) Payment: Payment for crushed stone stabilization, only where ordered by the Engineer, will be made in accordance with the unit price bid for the item, measured before placing, and shall include the removal of excavated materials.

12.28 Bracing and Sheeting: The sides of trenches and excavation for structures shall be securely held by stay bracing, or by skeleton or solid sheeting and bracing, as required by the soil conditions encountered, unless otherwise permitted by the Engineer. Timber bracing and sheeting shall also be used for the protection of other utilities and structures, as required.

Bracing and sheeting may be removed in units when the level of the backfilling has reached a point necessary to protect the pipe and adjacent property. When, in the opinion of the Engineer, sheeting and bracing cannot be safely removed, it shall be left in place.

(a) Payment: No extra payment will be made for timber bracing and sheeting except when ordered by the Engineer to be left in place, in which event it will be paid for in accordance with the unit price bid for the item in the Proposal.

12.29 Laying Iron Pipe: Pipe line alignment and gradients shall be straight or shall follow true curves as nearly as is practicable. Curvatures shall be within the allowable laying radius, horizontal or vertical.

Proper and suitable tools and equipment for safe and convenient handling and laying of iron pipe and fittings shall be used, and proper care shall be exercised to prevent damage to the exterior coating, and interior cement lining. All pipe and fittings shall be carefully examined for cracks and other defects before laying. If any pipe or fitting is discovered to be defective after having been laid, it shall be removed and replaced at the expense of the Contractor. Prior to joining the pipes, the interior of each section of pipe shall be swabbed clean of all deleterious material.

Whenever pipe is required to be cut, the cutting shall be done by skilled workmen using approved types of pipe cutters. The use of hammer and chisel and/or cutting torch will not be permitted.

Push-on joints shall be made in strict conformity with the recommendations of the pipe manufacturer, with special care used to insure proper fit and positioning to force the pipe home after having been brought to proper alignment and grade.

Mechanical joints shall be made only by experienced workmen. Sockets and spigots shall be washed with soapy water before slipping the gland and gasket over the spigot end of the pipe. The spigot shall be inserted into the socket full depth after which the gasket shall be pushed into position making sure that it is evenly seated in the socket. The gland shall then be moved into position for compressing the gasket. Bolts and nuts shall be tightened "finger-tight",

after which they shall be tightened to a uniform permanent tightness, using a torque wrench for tightening. Bolts shall be tightened alternately 180 degrees apart.

12.30 Laying Steel Pipe: Pipe line alignment and gradients shall be straight or shall follow true curves as near as it is practicable. Curvatures shall be within the allowable laying radius, horizontal or vertical.

Pipe and fittings shall be carefully lowered into the trench with special slings of wide belting or webbing. Prior to joining the pipes the interior of each section of pipe shall be swabbed clean of all deleterious material; bells and gasket grooves shall be wiped clean and the approved type of vegetable oil soap applied as directed by the manufacturer. The joint shall then be made in strict conformity with the recommendations of the pipe manufacturer, with special care used to insure proper fit and positioning of the rubber gasket, In order to prevent damage to the exterior coating and interior cement lining, proper and suitable jacking equipment shall be used to force the pipe home after having been brought to proper alignment and grade. The void in the bell to the gasket retainer bar shall then be filled with hot enamel as approved for pipe coating.

Field cuts shall be made by the Contractor only as necessary with an approved saw or lathe cutter. Cutting of steel pipe by torch will not be permitted.

Before lowering into trench, any pipe which has its coating damaged shall be repaired. Small abrasions may be daubed with a thick layer of enamel. Where abrasions are large and have broken the felt wrapping, the damaged material shall be removed, the pipe reprimed and coated with hot enamel. Felt shall then be smoothed onto the patch and the area coated again with hot enamel. Repairs and coating of special field joints shall be made using the same rapid priming solution and enamel used by the pipe manufacturer. Men working on the pipe shall be required to wear soft rubber soled shoes.

12.31 Installation Valves: Valves, in general, shall be installed and jointed as specified above for cast iron pipe and fittings. The installation of valves shall include the installation of valve boxes.

(a) Payment: Payment for the installation of valves will be made as a separate item based on the actual number of valves of various sizes installed at the unit prices bid in the Proposal.

12.32 Closing Pipe: When the work of pipe laying is suspended, either at night or at other times, the end of the pipe shall be closed with a suitable stopper or bulkhead to prevent entrance of foreign material into the pipe line.

12.33 Precaution Against Flotation: The Contractor shall take every precaution against floating of the pipe due to an accumulation of water in the trench before backfilling is completed. In the event of flotation, the Contractor shall relay such pipe in a manner directed by the Engineer, making good at his expense any injury or damage to the pipe line which may result.

12.34 Selected Backfilling: All trenches shall be backfilled immediately after pipes are laid in the trench, unless otherwise directed by the Engineer. Selected backfill material shall consist of finely divided earth, sand, stone dust, crushed stone, or other approved material. Backfill material shall be

carefully handplaced about the pipe and up to a height of at least 18 inches above the top of the pipe barrel, in uniform layers not exceeding 6 inches in thickness, each layer thoroughly compacted with proper hand tools in such manner as not to disturb or injure the pipe. Backfilling shall be carried on simultaneously on both sides of the pipe. If suitable select materials are not available from trench excavation, the Contractor will be required to obtain them from some other source.

12.35 General Backfilling: After selected backfill material has been placed and tamped, the remainder of the trench may be backfilled with general excavated material, except that no rock, unless in small shattered fragments, will be permitted to be mixed with other backfill material. Backfill material shall be placed in uniform layers not exceeding 12 inches in thickness, with each layer thoroughly compacted with heavy duty power tamping tools. At locations outside streets, roads, walks, or other traveled ways open to vehicular or pedestrian travel, the Engineer may waive the requirement of power compaction of backfill upon written request of the Contractor; in which case backfill material shall be windrowed and maintained in a suitable manner so as to concentrate and pond rainfall run-off over the trench. After sufficient settlement has been obtained, in the opinion of the Engineer, the Contractor shall complete surface dressing, remove surplus material and clean up in accordance with these Specifications.

Wherever trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the surface of the ground. Backfilling shall be carefully performed and the original surface restored as specified herein and to the full satisfaction of the Engineer. Surplus material shall be disposed of in such locations as the Engineer may direct.

12.36 Temporary Resurfacing of Trenches: Where trenches are in paved streets or across paved roadways and driveways open to vehicular traffic, the remaining 6 inches of backfill up to the travelled surface shall be made with compacted crushed stone. No extra payment will be made for crushed stone specified herein, the cost thereof to be included in the prices bid in the Proposal for replacing street pavement.

12.37 Tunneling for Highway and Railroad Crossings: Where called for on the plans, pipe lines across highways and railroads shall be constructed of pipe laid in lined tunnels.

Tunnels shall be circular in section and of the sizes and lengths shown on the plans. Tunneling methods shall conform to the best modern practice. Entry pits at tunnel ends shall be solid sheeted and braced. Tunnels shall be constructed with proper allowance made for line and grade of the pipe to be installed therein.

When required, corrugated structural steel pipe or liner plate shall be Armco or equal. After fabrication, the corrugated metal pipe or liner plate shall be hot-dipped galvanized and then fully bituminous coated to a minimum thickness of 0.05 of an inch. When required, steel casing pipe shall be manufactured from steel having a minimum yield point of 35,000 psi and then fully bituminous coated and wrapped with 15 pound asbestos felt on the interior.

Casing pipe may be reinforced concrete, corrugated metal, steel pipe, or tunnel liner, of the following sizes:

Size	Concrete	Corrugated Metal	Steel	Tunnel Liner
36	C-76, Table 5	12	.5625	12
48	C-76, Table 5	12	---	12

Concrete pipe if used, shall be furnished with two lines of circular reinforcement.

After the tunnel is completed, the pipe shall be installed therein to the lines and grades shown on the plans. Pipe shall be bedded or supported as detailed on the plans. Tunnel lining shall be left in place and each end shall be closed with a masonry wall having a minimum thickness of at least 8 inches. Suitable weepholes, not less than 8 inches by 4 inches in size shall be provided in each wall to afford drainage.

(a) Railroad Requirements:

(1) Interference with Railroad Operations: The Contractor shall so arrange and conduct his work that there will be no interference with railroad operations, including train, signal, telephone and telegraph service or damage to the property of the Railroad Company or poles, wires and other facilities on the right-of-way. The Railroad Engineer may take such precautions as he deems advisable to insure safety of trains or tracks.

(2) Watching and Flagging Protection: Any watching or flagging service required by the Railway Company for the safety of railroad operations, because of work being performed by the Contractor or in connection therewith, will be provided by the Railway Company and the cost thereof shall be paid by the Contractor to the Railway Company.

(3) Damage by Railway Traffic: The Contractor shall assume all responsibility for any and all damage to his work, employees, equipment and materials, caused by operations to the Railway Company.

(4) Drainage Facilities: The Contractor shall preserve the effectiveness of any drainage facilities on railroad right-of-way or adjacent to tracks during his operations and leave them in as good condition and effectiveness as he found them.

(5) Insurance: The Contractor shall take out for the purpose of insuring against any and all risks or loss of life, personal injury, and property loss or damage, which may grow out of, or result from, or by reason of, or in connection with, said work or the acts of or operations of the Contractor, and maintain in full force and effect for the duration of the work, policies of insurance hereinafter specifically mentioned; said policies of insurance to be not less than the amounts stipulated, as well as any other or additional insurance which should be taken out and maintained in force for or in connection with such work by the Contractor in compliance with any Federal, State or Municipal law, stature, or regulation, and

furnish to the Owner, before commencing said work, the original of the policy, or duly certified copies of such insurance, or in lieu thereof, certificates from the underwriters of such insurance, viz:

a. Workmen's Compensation or Employer's Liability Insurance according to the laws of the State.

b. Contractor's Public Liability Insurance to protect the Contractor and subcontractors:

1. For loss of life or injury to persons in the amount of $150,000.00 for any one person and $300,000.00 for any one accident.

2. For property loss or damage in the amount of $150,000.00 for each accident and not less than $300,000.00 aggregate.

c. The original policy of Railroad Protective Liability Insurance naming the Railway Company as the insured; shall be designed as:

1. For loss of life or injury to person in an amount not less than $150,000.00 for any one person and not less than $300,000.00 for any one accident.

2. For property loss or damage in an amount not less than $300,000.00 aggregate. The Contractor shall comply with all special requirements of the Railroad Company as related to Public Liability and Property Damage Insurance and shall furnish copies of certificates of coverage for such insurance taken out in favor of the Railroad Company, as well as copies of certificates for such insurance taken out in the name of the Contractor.

3. Indemnity: The Contractor shall indemnify and save harmless the Railroad Company against any and all loss, or damage to property of the Company and against claims, demands, suits judgments, fines or sums of money accruing or claimed to accrue to any person, corporation, municipality, firm or company, against the Company, for any loss of life, or personal injury, or property loss or damage, whatsoever or for violation of any municipal law or regulation, growing out of, or claiming to grow out of, any act or omission of or method pursued, or hazard encountered, by the Contractor, or his agent, servant, or employee engaged or employed in or about or in connection with the work to be done by the Contractor, and against any and all claims or liens which may be made or placed upon said work by any laborer, materialman or furnisher, or any other person.

4. Notification of Starting Work: The Contractor shall notify the Superintendent of the Railway Company, at least fifteen days in advance when he will start work adjacent to tracks.

12.38 Concrete Blocking: Concrete blocking shall be formed and poured with Class "B" concrete in accordance with the details shown on the plans, at locations shown on the plans or as directed by the Engineer. In general, blocking shall be provided at the backs of hydrants, line fittings and outlets. Cast iron pipe struts shall be used with concrete blocking as required. Concrete blocking shall be poured against undisturbed earth having a bearing value of not less than 2,500 lbs. per square foot.

(a) Payment: Payment for concrete blocking will be paid for on the basis of actual quantity placed at the unit price bid in the Proposal, such pric to include all costs of excavation, forming and furnishing and placing of concrete and furnishing pipe struts.

12.39 Installation of Blow-Offs and Air-Vents: Blow-offs and air-vents shall be constructed in accordance with the details shown on the plans and at the locations indicated.

(a) Payment: Payment for blow-offs and air-vents will be made in accordance with the following:

(1) Blow-Offs: In accordance with the lump sum prices bid in the Proposal for each blow-off connection. The lump sum shall include all cost of furnishing and installation of the blow-off as detailed on the plans and includes 6-inch gate valve, valve box, cast iron pipe and fittings, retainer gland, splash pad and blocking.

(2) Air-Vents: In accordance with the lump sum prices bid in the Proposal for each size air-vent. The lump sum price shall include all costs for furnishing and installation of the air-vent as detailed on the Plans and includes the air valve, piping, corporation stop, manhole, and manhole castings.

12.40 Connections to Existing Cast Iron Pipe Lines: Connections to existing cast iron pipe lines shall, in general, be made by the use of tapping sleeves and valves, except as specifically shown on the drawings to be otherwise, or as may be directed by the Engineer. The Contractor shall furnish the tapping sleeve and valve, the valve tapping machine, and all other equipment required for such installation. Tapping sleeves and valves shall be installed under the supervision of skilled mechanics.

(a) Location: The Contractor shall, before opening pipe line trenches, locate the various points of connections to be made into existing pipe lines and shall uncover as necessary for the Engineer to prescribe the types of connections and fittings to be installed.

(b) Interruption of Service: Connections to existing pipe lines shall be made only at such times and in such manner as will meet operating requirements. No cut shall be made in existing lines until the permission of the Superintendent of the Water Works has been obtained as to time and manner of making the cuts and connections. All existing valves shall be operated only by authorized representatives of the Owner.

(c) Payment: Payment for connections to existing lines will be paid for at the unit prices listed in the Proposal. The cost of pipe, fittings, valves, tapping sleeves and valves, concrete blocking and strapping will be paid for separately at the unit prices listed in the Proposal. The

cost of connections to existing pipe lines and all cost incidental thereto except materials listed above shall be included in the unit price bid for the connection as listed in the Proposal.

12.41 Testing Pipe Lines: Upon completion of a section of pipe line from valve to valve, the line shall be filled with water and all air exhausted. A test pressure shall then be applied and maintained for a period of 24 hours, adding accurately measured quantities of water as required. Leakage shall not exceed 15 gallons per inch diameter per mile per 24 hours. Test pressure shall be 200 p.s.i. pressure gage at low elevation of the 16-inch pipe.

All visible leaks along the pipe line shall be repaired regardless of whether the total leakage is within the allowable limit. Defective material shall be removed and replaced at the expense of the Contractor. Leaking joints shall be carefully remade or repaired. Leakage tests shall again be conducted after defective material has been replaced or joints repaired, and shall continue until the line passes the required test.

The Contractor shall furnish all labor, materials and equipment necessary to conduct leakage tests including a satisfactory test pump, necessary gauges and adequate facilities for the accurate measurement of water introduced into the line during the test period. No extra payment will be made for work under this section, the cost thereof to be included in the unit prices bid for furnishing and installing pipe.

12.42 Sterilizing Pipe Lines: All pipe lines and appurtenances, both existing and newly constructed, which have been exposed to contamination by reason of this construction, shall be sterilized after testing and flushing of the lines has been completed. Lines shall be filled with fresh water containing 50 parts per million of chlorine and allowed to stand for a period of 24 hours. Lines shall then be flushed until a chlorine residual of not more than 3 parts per million has been attained, at which time a sample shall be collected for bacteriological examination. Lines which do not show effective sterilization as determined from bacteriological examination shall be re-sterilized before being placed into service.

The Contractor shall furnish all labor, materials and equipment needed in the sterilization procedure. No extra payment will be made for sterilizing pipe lines, excepting the existing 20" raw water line, the cost thereof to be included in the unit prices bid for furnishing and installing pipe.

12.43 Acceptance of Work: Pipe lines and appurtenances will not be considered ready for acceptance until all provisions of these Specifications have been complied with, until all tests have been satisfactorily completed and until final inspection of all the work has been made. The Owner may put parts of the system in service before final acceptance.

12.44 Replacing Pavement: Upon completion of backfilling and consolidation of the backfill, the Contractor shall furnish all materials and labor and shall replace all pavements removed for construction of the pipe lines, and appurtenances; and shall also remove and replace, at his own expense, any and all pavements adjacent to pipe trenches which may have been disturbed or damaged as the result of construction operations. When required, the Contractor shall conduct load test to prove proper consolidation of backfill to sustain a load of 2,500 pounds per square foot without undue settlement. Replacement shall be in accordance with the regulations of the City of Athens, and in accordance with

applicable provisions of the standard specifications of the State Highway Department.

(a) Replacement: Asphaltic concrete and concrete pavement, including driveways, shall be replaced to a minimum width of nine (9") inches beyond the top edges of outside of the trench excavation to allow solid bearing.

(1) Concrete Pavement: Concrete pavement shall be replaced with a minimum depth of eight (8") inches of concrete having a minimum compressive strength of 3,000 p.s.i. in 28 days.

(2) Asphaltic Concrete (Used to replace asphalt and surface treatment paving.) A primed and sealed crushed stone base shall be used for pavement replacement. The crushed stone base course shall consist of a compacted 6-inch thickness of water-bound Macadam with stone size 3/4-inch and smaller.

The wearing course shall consist of asphaltic concrete, prepared with fine aggregate and asphaltic cement, applied at a rate of 150 pounds per square yard, in full conformance with the aforesaid Standard Highway Specifications.

(b) Time for Completion of Pavement Replacement: In the event weather conditions do not permit the permanent replacement of pavement immediately subsequent to the completion of pipe line construction, the Contractor will be required to maintain temporary surfacing until such time as the weather is suitable for paving operations. Any such delay will not be counted against the contract completion time, provided, that all other work to be performed under the contract is completed within the specified time.

(c) Payment: Payment for concrete pavement, surface treatment and asphaltic concrete will be made on a lineal foot of trench basis, regardless of width at the unit prices stated in the Proposal.

12.45 Replacing Unpaved Street Surfacing: Where water lines are constructed on unpaved streets, roads or driveways, the surfacing material shall be stripped and windrowed separately from the general material excavated from trenches. After the line has been installed and the backfill completed within 6 inches of the original street grade, the salvaged surfacing shall be replaced. This work shall be considered as general cleanup along with the removal of surplus excavation materials from the street surface and the restoring of the topsoil surfacing outside trench limits to its original condition, the cost of which shall be included in the unit prices bid for pipelines.

12.46 Measurement of Pipe Lines for Payment: Measurement for pipe lines for payment will be made along the center line of the pipe between center lines of terminal or other fittings and/or to points of connection with existing mains. No deductions in measured length will be made for lengths of valves or fittings.

12.47 Air Valves: Furnish and install air valves as shown on the drawings as manufactured by Crispin, APCO, or approved equal.

12.48 Payment for Pipe Lines: Payment for 16-inch pipe lines will be made in accordance with the unit prices bid in the Proposal which shall include the

costs of furnishing and installing the pipe with a minimum cover of 3 feet. The cost of furnishing and installing any required closure sections or adapters for pressure concrete pipe or steel pipe, shall also be included in the unit prices bid for the pipe.

Payment for pipe lines smaller than 16-inch will be made in accordance with the unit prices bid in the Proposal for the various sizes of pipe.

(CERTIFIED COPY)

GENERAL POWER OF ATTORNEY

No. 79734

Know all Men by these Presents:

That UNITED STATES FIDELITY AND GUARANTY COMPANY, a corporation organized and existing under the laws of the State of Maryland, and having its principal office at the City of Baltimore, in the State of Maryland, does hereby constitute and appoint **Russell H. Miles, W. G. M. Snow, C. R. Nelms and L. L. Edwards** of the City of **Kingsport**, State of **Tennessee**, its true and lawful attorneys in and for the States of **Tennessee, Kentucky, North Carolina, South Carolina, Virginia and Georgia** for the following purposes, to wit:

To sign its name as surety to, and to execute, seal and acknowledge any and all bonds, and to respectively do and perform any and all acts and things set forth in the resolution of the Board of Directors of the said UNITED STATES FIDELITY AND GUARANTY COMPANY, a certified copy of which is hereto annexed and made a part of this Power of Attorney; and the said UNITED STATES FIDELITY AND GUARANTY COMPANY, through us, its Board of Directors, hereby ratifies and confirms all and whatsoever ~~the said~~ **anyone of the said Russell H. Miles and the said W. G. M. Snow and the said C. R. Nelms and the said L. L. Edwards** may lawfully do in the premises by virtue of these presents.

In Witness Whereof, the said UNITED STATES FIDELITY AND GUARANTY COMPANY has caused this instrument to be sealed with its corporate seal, duly attested by the signatures of its Vice-President and Assistant Secretary, this **22nd** day of **November**, A. D. 1968

UNITED STATES FIDELITY AND GUARANTY COMPANY.

(Signed) *By* Charles W. Boone
Vice-President.

(SEAL)

(Signed) David L. Royer
Assistant Secretary.

STATE OF MARYLAND,
BALTIMORE CITY, } ss:

On this **22nd** day of **November**, A. D. 1968, before me personally came **Charles W. Boone**, Vice-President of the UNITED STATES FIDELITY AND GUARANTY COMPANY and **David L. Royer**, Assistant Secretary of said Company, with both of whom I am personally acquainted, who being by me severally duly sworn, said that they resided in the City of Baltimore, Maryland; that they, the said **Charles W. Boone** and **David L. Royer** were respectively the Vice-President and the Assistant Secretary of the said UNITED STATES FIDELITY AND GUARANTY COMPANY, the corporation described in and which executed the foregoing Power of Attorney; that they each knew the seal of said corporation; that the seal affixed to said Power of Attorney was such corporate seal, that it was so fixed by order of the Board of Directors of said corporation, and that they signed their names thereto by like order as Vice-President and Assistant Secretary, respectively, of the Company.

My commission expires the first day in July, A. D. 19...69...

(SEAL) (Signed) Herbert J. Aull
Notary Public.

STATE OF MARYLAND
BALTIMORE CITY, } Sct.

I, **Robert H. Bouse**, Clerk of the Superior Court of Baltimore City, which Court is a Court of Record, and has a seal, do hereby certify that **Herbert J. Aull**, Esquire, before whom the annexed affidavits were made, and who has thereto subscribed his name, was at the time of so doing a Notary Public of the State of Maryland, in and for the City of Baltimore, duly commissioned and sworn and authorized by law to administer oaths and take acknowledgments, or proof of deeds to be recorded therein. I further certify that I am acquainted with the handwriting of the said Notary, and verily believe the signature to be his genuine signature.

In Testimony Whereof, I hereto set my hand and affix the seal of the Superior Court of Baltimore City, the same being a Court of Record, this **22nd** day of **November**, A. D. 19 68

(SEAL) (Signed) Robert H. Bouse
Clerk of the Superior Court of Baltimore City.

FS 3 (9-67)

COPY OF RESOLUTION

That Whereas, it is necessary for the effectual transaction of business that this Company appoint agents and attorneys with power and authority to act for it and in its name in States other than Maryland, and in the Territories of the United States and in the Provinces of the Dominion of Canada and in the Colony of Newfoundland.

Therefore, be it Resolved, that this Company do, and it hereby does, authorize and empower its President or either of its Vice-Presidents in conjunction with its Secretary or one of its Assistant Secretaries, under its corporate seal, to appoint any person or persons as attorney or attorneys-in-fact, or agent or agents of said Company, in its name and as its act, to execute and deliver any and all contracts guaranteeing the fidelity of persons holding positions of public or private trust, guaranteeing the performances of contracts other than insurance policies and executing or guaranteeing bonds and undertakings, required or permitted in all actions or proceedings, or by law allowed, and

Also, in its name and as its attorney or attorneys-in-fact, or agent or agents to execute and guarantee the conditions of any and all bonds, recognizances, obligations, stipulations, undertakings or anything in the nature of either of the same, which are or may by law, municipal or otherwise, or by any Statute of the United States or of any State or Territory of the United States or of the Provinces of the Dominion of Canada or of the Colony of Newfoundland, or by the rules, regulations, orders, customs, practice or discretion of any board, body, organization, office or officer, local, municipal or otherwise, be allowed, required or permitted to be executed, made, taken, given, tendered, accepted, filed or recorded for the security or protection of, by or for any person or persons, corporation, body, office, interest, municipality or other association or organization whatsoever, in any and all capacities whatsoever, conditioned for the doing or not doing of anything or any conditions which may be provided for in any such bond, recognizance, obligation, stipulation, or undertaking, or anything in the nature of either of the same.

I, David M. Engler, an Assistant Secretary of the UNITED STATES FIDELITY AND GUARANTY COMPANY, do hereby certify that the foregoing is a full, true and correct copy of the original power of attorney given by said Company to Russell H. Miles, W. G. M. Snow, C. R. Nelms and L. L. Edwards

of Kingsport, Tennessee, authorizing and empowering them to sign bonds as therein set forth, which power of attorney has never been revoked and is still in full force and effect.

And I do further certify that said Power of Attorney was given in pursuance of a resolution adopted at a regular meeting of the Board of Directors of said Company, duly called and held at the office of the Company in the City of Baltimore, on the 11th day of July, 1910, at which meeting a quorum of the Board of Directors was present, and that the foregoing is a true and correct copy of said resolution, and the whole thereof as recorded in the minutes of said meeting.

In Testimony Whereof, I have hereunto set my hand and the seal of the UNITED STATES FIDELITY AND GUARANTY COMPANY on August 8, 1969
(Date)

David M. Engler
Assistant Secretary.